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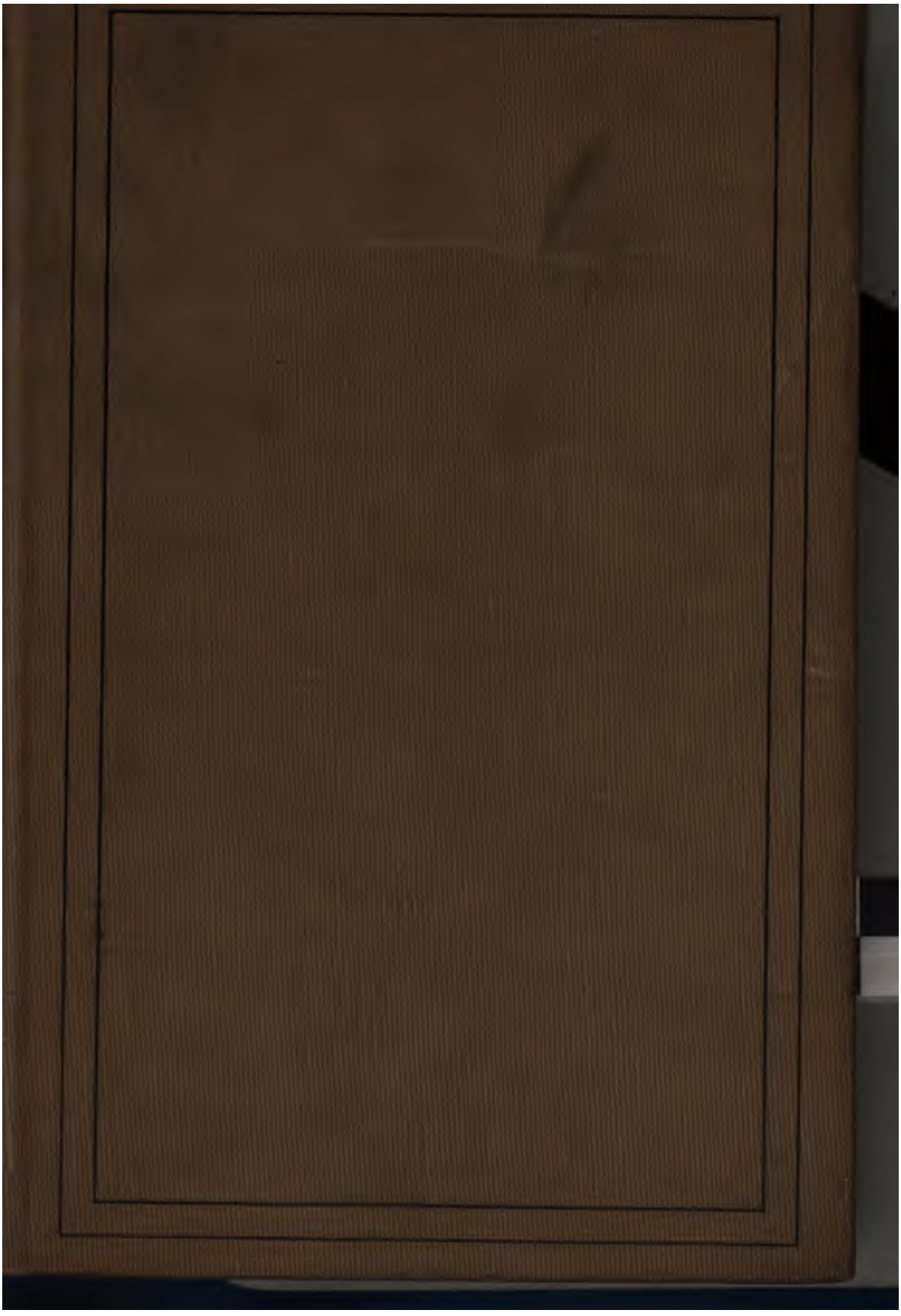

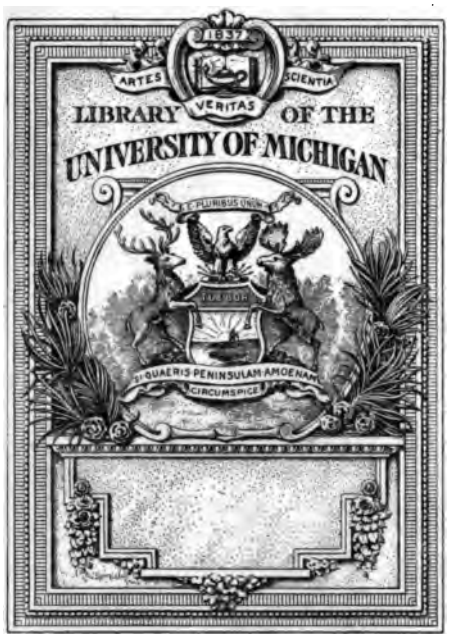
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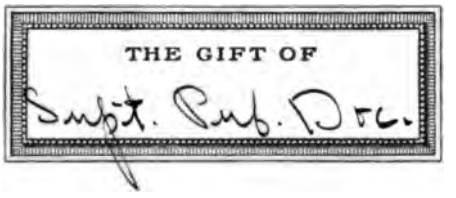
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SIXTH ANNUAL REPORT

OF THE

RECLAMATION SERVICE

1906-1907

F. H. NEWELL, DIRECTOR

WASHINGTON
GOVERNMENT PRINTING OFFICE
1907

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LETTERS OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
Washington, December 2, 1907.

SIR: The act of Congress approved June 17, 1902, entitled "An act appropriating the receipts from the sale and disposal of public lands in certain States and Territories to the construction of irrigation works for the reclamation of arid lands," provides (sec. 2) as follows:

That the Secretary of the Interior is hereby authorized and directed to make examinations and surveys for, and to locate and construct, as herein provided, irrigation works for the storage, diversion, and development of waters, including artesian wells, and to report to Congress at the beginning of each regular session as to the results of such examinations and surveys, giving estimates of cost of all contemplated works, and quantity and location of the lands which can be irrigated therefrom, and all facts relative to the practicability of each irrigation project; also the cost of works in process of construction, as well as those which have been completed.

In compliance with the requirements of the statute, I have the honor to transmit herewith the report contemplated by the above-mentioned section of the act of June 17, 1902.

Very respectfully,

JAMES RUDOLPH GARFIELD,
Secretary.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

DEPARTMENT OF THE INTERIOR,
UNITED STATES RECLAMATION SERVICE,
Washington, D. C., November 30, 1907.

SIR: I have the honor to transmit herewith a report of the work done and in progress under the reclamation act approved by the President on June 17, 1902, together with other information essential to an understanding of the subject.

This report supplements the first, second, third, fourth, and fifth annual reports of the Reclamation Service already printed. It relates in particular to the operations during the fiscal year ended June 30, 1907, but in a few instances information of a later date has been inserted, particularly in connection with operations that are nearly completed. The report describes the progress that has been made on projects authorized for building. In the five years that have elapsed since the passage of the act work has begun on most of the large projects that are to be built in the near future, and extensive areas in various parts of the arid West have been brought under water.

In accordance with the terms of the reclamation act the money spent in constructing the works is commencing to return for use in other reclamation enterprises, and every precaution is being taken that this feature of the law shall be effectively administered.

Very respectfully,

F. H. NEWELL, *Director.*

The SECRETARY OF THE INTERIOR.

SIXTH ANNUAL REPORT

OF THE

RECLAMATION SERVICE.

F. H. NEWELL, *Director.*

GENERAL DISCUSSION.

LEGISLATION.

The reclamation act and acts of Congress affecting the operations thereunder were printed in the Fifth Annual Report, pages 15–24. For convenience of reference the reclamation act is now reprinted, together with laws enacted at the last session of Congress affecting operations under that act.

RECLAMATION ACT.

AN ACT Appropriating the receipts from the sale and disposal of public lands in certain States and Territories to the construction of irrigation works for the reclamation of arid lands.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That all moneys received from the sale and disposal of public lands in Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Utah, Washington, and Wyoming, beginning with the fiscal year ending June thirtieth, nineteen hundred and one, including the surplus of fees and commissions in excess of allowances to registers and receivers, and excepting the five per centum of the proceeds of the sales of public lands in the above States set aside by law for educational and other purposes, shall be, and the same are hereby, reserved, set aside, and appropriated as a special fund in the Treasury to be known as the "reclamation fund," to be used in the examination and survey for and the construction and maintenance of irrigation works for the storage, diversion, and development of waters for the reclamation of arid and semiarid lands in the said States and Territories, and for the payment of all other expenditures provided for in this act: *Provided,* That in case the receipts from the sale and disposal of public lands other than those realized from the sale and disposal of lands referred to in this section are insufficient to meet the requirements for the support of agricultural colleges in the several States and Territories, under the act of August thirtieth, eighteen hundred and ninety, entitled "An act to apply a portion of the proceeds of the public lands to the more complete endowment and support of the colleges for the benefit of agriculture and the mechanic arts, established under the provisions of an act of Congress approved July second, eighteen hundred and sixty-two," the deficiency, if any, in the sum necessary for the support of the said colleges shall be provided for from any moneys in the Treasury not otherwise appropriated,

SEC. 2. That the Secretary of the Interior is hereby authorized and directed to make examinations and surveys for, and to locate and construct, as herein provided, irrigation works for the storage, diversion, and development of waters, including artesian wells, and to report to Congress at the beginning of each regular session as to the results of such examinations and surveys, giving estimates of cost of all contemplated works, the quantity and location of the lands which can be irrigated therefrom, and all facts relative to the practicability of each irrigation project; also the cost of works in process of construction as well as of those which have been completed.

SEC. 3. That the Secretary of the Interior shall, before giving the public notice provided for in section four of this act, withdraw from public entry the lands required for any irrigation works contemplated under the provisions of this act, and shall restore to public entry any of the lands so withdrawn when, in his judgment, such lands are not required for the purposes of this act; and the Secretary of the Interior is hereby authorized, at or immediately prior to the time of beginning the surveys for any contemplated irrigation works, to withdraw from entry, except under the homestead laws, any public lands believed to be susceptible of irrigation from said works: *Provided*, That all lands entered and entries made under the homestead laws within areas so withdrawn during such withdrawal shall be subject to all the provisions, limitations, charges, terms, and conditions of this act; that said surveys shall be prosecuted diligently to completion, and upon the completion thereof, and of the necessary maps, plans, and estimates of cost, the Secretary of the Interior shall determine whether or not said project is practicable and advisable, and if determined to be impracticable or unadvisable he shall thereupon restore said lands to entry; that public lands which it is proposed to irrigate by means of any contemplated works shall be subject to entry only under the provisions of the homestead laws in tracts of not less than forty nor more than one hundred and sixty acres, and shall be subject to the limitations, charges, terms, and conditions herein provided: *Provided*, That the commutation provisions of the homestead laws shall not apply to entries made under this act.

SEC. 4. That upon the determination by the Secretary of the Interior that any irrigation project is practicable, he may cause to be let contracts for the construction of the same, in such portions or sections as it may be practicable to construct and complete as parts of the whole project, providing the necessary funds for such portions or sections are available in the reclamation fund, and thereupon he shall give public notice of the lands irrigable under such project, and limit of area per entry, which limit shall represent the acreage which, in the opinion of the Secretary, may be reasonably required for the support of a family upon the lands in question; also of the charges which shall be made per acre upon the said entries, and upon lands in private ownership which may be irrigated by the waters of the said irrigation project, and the number of annual installments, not exceeding ten, in which such charges shall be paid and the time when such payments shall commence. The said charges shall be determined with a view of returning to the reclamation fund the estimated cost of construction of the project, and shall be apportioned equitably: *Provided*, That in all construction work eight hours shall constitute a day's work, and no Mongolian labor shall be employed thereon.

SEC. 5. That the entryman upon lands to be irrigated by such works shall, in addition to compliance with the homestead laws, reclaim at least one-half of the total irrigable area of his entry for agricultural purposes, and before receiving patent for the lands covered by his entry shall pay to the Government the charges apportioned against such tract, as provided in section four. No right to the use of water for land in private ownership shall be sold for a tract exceeding one hundred and sixty acres to any one landowner, and no such sale shall be made to any landowner unless he be an actual bona fide resident on such land, or occupant thereof residing in the neighborhood of said land, and no such right shall permanently attach until all payments therefor are made. The annual installments shall be paid to the receiver of the local land office of the district in which the land is situated, and a failure to make any two payments when due shall render the entry subject to cancellation, with the forfeiture of all rights under this act, as well as of any moneys already paid thereon. All moneys received from the above sources shall be paid into the reclamation fund. Registers and receivers shall be allowed the usual commissions on all moneys paid for lands entered under this act.

SEC. 6. That the Secretary of the Interior is hereby authorized and directed to use the reclamation fund for the operation and maintenance of all reservoirs and irrigation works constructed under the provisions of this act: *Provided*, That when the payments required by this act are made for the major portion of the lands irrigated from the waters of any of the works herein provided for, then the management and operation of such irrigation works shall pass to the owners of the lands irrigated thereby, to be maintained at their expense under such form of organization and under such rules and regulations as may be acceptable to the Secretary of the Interior: *Provided*, That the title to and the management and operation of the reservoirs and the works necessary for their protection and operation shall remain in the Government until otherwise provided by Congress.

SEC. 7. That where in carrying out the provisions of this act it becomes necessary to acquire any rights or property, the Secretary of the Interior is hereby authorized to acquire the same for the United States by purchase or by condemnation under judicial process, and to pay from the reclamation fund the sums which may be needed for that purpose, and it shall be the duty of the Attorney-General of the United States upon every application of the Secretary of the Interior, under this act, to cause proceedings to be commenced for condemnation within thirty days from the receipt of the application at the Department of Justice.

SEC. 8. That nothing in this act shall be construed as affecting or intended to affect or to in any way interfere with the laws of any State or Territory relating to the control, appropriation, use, or distribution of water used in irrigation, or any vested right acquired thereunder, and the Secretary of the Interior, in carrying out the provisions of this act, shall proceed in conformity with such laws, and nothing herein shall in any way affect any right of any State or of the Federal Government or of any landowner, appropriator, or user of water in, to, or from any interstate stream or the waters thereof: *Provided*, That the right to the use of water acquired under the provisions of this act shall be appurtenant to the land irrigated, and beneficial use shall be the basis, the measure, and the limit of the right.

SEC. 9. That it is hereby declared to be the duty of the Secretary of the Interior in carrying out the provisions of this act, so far as the same may be practicable and subject to the existence of feasible irrigation projects, to expend the major portion of the funds arising from the sale of public lands within each State and Territory hereinbefore named for the benefit of arid and semiarid lands within the limits of such State or Territory: *Provided*, That the Secretary may temporarily use such portion of said funds for the benefit of arid or semiarid lands in any particular State or Territory hereinbefore named as he may deem advisable, but when so used the excess shall be restored to the fund as soon as practicable, to the end that ultimately, and in any event, within each ten-year period after the passage of this act, the expenditures for the benefit of the said States and Territories shall be equalized according to the proportions and subject to the conditions as to practicability and feasibility aforesaid.

SEC. 10. That the Secretary of the Interior is hereby authorized to perform any and all acts and to make such rules and regulations as may be necessary and proper for the purpose of carrying the provisions of this act into full force and effect. [32 Stat. L., 388.]

Approved June 17, 1902.

EMPLOYMENT OF INDIAN LABOR ON RECLAMATION PROJECTS.

The Indian appropriation act approved March 1, 1907 (34 Stat. L., 1015–1052), contains the following provisions relative to the employment of Indian labor on reclamation projects:

That as far as practicable Indian labor shall be employed and purchase in the open market made from Indians, under the direction of the Secretary of the Interior. And the employment of such Indians and the hiring of their property, in connection with the construction of any irrigation project under the Reclamation Service, shall be exempt from the provisions of sections thirty-seven hundred and nine and thirty-seven hundred and forty-four, Revised Statutes. [34 Stat. L., 1015.]

CONVEYANCES OF LAND BY NONCOMPETENT INDIANS.

The same law also contains the following provision relative to conveyances of land by noncompetent Indians:

That any noncompetent Indian to whom a patent containing restrictions against alienation has been issued for an allotment of land in severalty, under any law or treaty, or who may have an interest in any allotment by inheritance, may sell or convey all or any part of such allotment or such inherited interest on such terms and conditions and under such rules and regulations as the Secretary of the Interior may prescribe, and the proceeds derived therefrom shall be used for the benefit of the allottee or heir so disposing of his land or interest, under the supervision of the Commissioner of Indian Affairs; and any conveyance made hereunder and approved by the Secretary of the Interior shall convey full title to the land or interest so sold, the same as if fee simple patent had been issued to the allottee. [34 Stat. L., 1018.]

BLACKFEET INDIAN RESERVATION, MONT.

The same law also contains the following provision in regard to disposition of lands opened to settlement in the Blackfeet Indian Reservation:

That if, after the approval of the classification and appraisement, as provided herein, there shall be found lands within the limits of the reservation under irrigation projects deemed practicable under the provisions of the act of Congress approved June seventeenth, nineteen hundred and two, known as the reclamation act, said lands shall be subject to withdrawal and be disposed of under the provisions of said act, and settlers shall pay, in addition to the cost of construction and maintenance provided therein the appraised value, as provided in this act, to the proper officers, to be covered into the Treasury of the United States to the credit of the Indians: *Provided, however*, That all lands hereby opened to settlement remaining undisposed of at the end of five years from the taking effect of this act shall be sold to the highest bidder for cash, at not less than one dollar and twenty-five cents per acre, under rules and regulations prescribed by the Secretary of the Interior; and any lands remaining unsold ten years after said lands shall have been opened to entry shall be sold to the highest bidder, for cash, without regard to the minimum limit above stated: *Provided*, That not more than six hundred and forty acres of land shall be sold to any one person or company. [34 Stat. L., 1037.]

IRRIGATION FOR PIMA INDIANS, ARIZONA.

The same law also contains the following provision authorizing the Secretary of the Interior to use part of the sum appropriated for an irrigation system for the Pima Indians in payment of their proportion of the cost of constructing the Salt River project:

That the Secretary of the Interior may, in his discretion, use such part of the three hundred thousand dollars heretofore appropriated for an irrigation system for the Pima Indians in the payment of such Indians' proportionate part of the construction of the Salt River project, and such funds may be transferred to the reclamation fund, to be expended by that Service in accordance with its rules and regulations; the Indians to receive a credit upon the reclamation charge assessed against their lands under the Salt River project for the amount so transferred. [34 Stat. L., 1022.]

CONSTRUCTION OF RIO GRANDE DAM.

The act making appropriations for the sundry civil expenses of the Government for the fiscal year ending June 30, 1908, contains the following provision in pursuance of a convention between the United States and Mexico proclaimed January 16, 1907:

Convention with Mexico: Toward the construction of a dam for storing and delivering sixty thousand acre-feet of water annually, in the bed of the Rio

Grande at the point where the head works of the Acequia Madre now exists, above the city of Juarez, Mexico, as provided by a convention between the United States and Mexico, proclaimed January sixteenth, nineteen hundred and seven, one million dollars, to be available as needed and to be expended under the direction of the Secretary of the Interior in connection with the irrigation project on the Rio Grande: *Provided*, That the balance of the cost of said irrigation project over and above the amount herein appropriated shall be alloted by the Secretary of the Interior, as may be needed and as may be available from time to time, from the reclamation fund and collected from the settlers and owners of the land benefited under the provisions of the reclamation act approved June seventeenth, nineteen hundred and two, and acts supplemental thereto or amendatory thereof. [34 Stat. L., 1357.]

DECISIONS OF THE SECRETARY OF THE INTERIOR.

The following is a brief statement of decisions of general interest relating to the reclamation act which have been rendered by the Secretary of the Interior during the past year; a few decisions by the Comptroller of the Treasury are included:

ABSTRACTS OF TITLE.

NO ABSTRACT REQUIRED WHERE LAND IS DONATED.

November 21, 1906.—In cases of lands donated to the Government for canal and lateral purposes an abstract of title will not be required, but in lieu thereof a certificate of the engineer that the tax records have been examined, and indicate that the grantors are the owners; that the said parties are the reputed owners and that the land is not in the possession of one claiming adversely to the grantors will be acceptable.

EXAMINATION OF ABSTRACTS.

August 15, 1907.—Abstracts of title should be examined by local counsel familiar with the local law applicable to titles of real estate, corporations, and water rights. They should be indexed, when composed of more than ten instruments, and should be accompanied by a formal opinion upon the condition of title shown, preferably that of the local United States attorney; but if that can not be obtained, then that of local counsel familiar with local law applicable; or if such is not obtainable, then, in any event, by that of the law officer of the Reclamation Service.

PREPARATION OF ABSTRACTS.

November 28, 1906.—Abstracts should be prepared by a bonded abstractor, abstract company, or public officer, bonded or otherwise, whose duty it is to furnish such information. Where no such parties are available, the agency used by the community generally will be acceptable. Abstracts received from such source shall be accompanied by certificates of some officer of the Service and the United States attorney as to the responsibility of the abstractor.

CONTRACTS AND BONDS.

COMPUTATION OF CONTRACT "HOLDBACK."

February 2, 1907.—In computing 50 per cent of a contract for construction upon which a deduction of 20 per cent is retained, the

whole amount of work under the contract must be considered, and not merely the estimated amount. (Comptroller's decision.)

EXTENSIONS OF TIME ON CONTRACTS.

April 16, 1907.—The power of the Secretary of the Interior to extend a contract is limited to causes which were beyond the control of the contractor, such as acts of Providence, fortuitous events, or the like, within the meaning of the contract. (Comptroller's decision.)

FURNISHING INFORMATION TO SURETIES.

February 7, 1907.—No statement should be given by any official to a surety tending to indicate that there might be no liability or the extent of the liability, if any, until the work has been completed and the liability of the principal, if any, has been ascertained.

PENALTY FOR DELAYS IN CONTRACTS.

December 5, 1906.—Where a contract provides for a penalty of a certain amount per day for every day occupied in excess of the time set for the completion of the contract, the word "occupied" used in this connection is construed to mean that the duration of a delay shall be computed upon a basis of the actual working days, exclusive of holidays and Sundays. An executive officer has no authority to waive the provisions of a contract relating to deductions for delays, though the Government has suffered no loss by the delay. (Comptroller's decision.)

EIGHT-HOUR LAW.

November 3, 1906.—To the engineer in charge, subject to review by his superiors, shall be intrusted the discretion in determining upon the existence of an extraordinary emergency requiring work in excess of eight hours. Extraordinary emergency is not defined, but depends wholly upon the facts of each particular case. However, the following has been given as a definition: "An extraordinary emergency is the sudden, unexpected happening of something not of the usual, customary, or regular kind, demanding prompt action to avert imminent danger of life, limb, health, or property; the possibility of either is not enough. The peril must be sudden, unusual, imminent, and actual in order to constitute an extraordinary emergency."

ENTRIES AND ENTRYMEN.

APPLICATIONS.

June 29, 1907.—No such right is acquired against the Government by the mere tender of an application to enter public land as entitles the applicant to even equitable consideration where the interests of the Government intervene, nor does such application have the effect to segregate the land from the public domain, so as to prevent a withdrawal thereof for reclamation purposes. All uncompleted applications pending at the time of withdrawal of lands for use in the construction and operation of irrigation works, or of

lands susceptible of irrigation thereunder, shall be rejected or disregarded, except that homestead entries may be allowed for lands susceptible of irrigation subject to the conditions and limitations of the reclamation act. Where the settlement is based upon actual settlement preceding withdrawal, favorable consideration will be contingent upon the exclusion of the land from the withdrawal. (35 L. D., 649.)

RESIDENCE.

December 31, 1906.—After a residence has once been established in good faith temporary absence from the homestead for the purpose of earning a living, not inconsistent with an honest intention to comply with the law, will not of itself constitute abandonment, but will be considered as constructive residence upon the land, especially where good faith in all other respects is manifest.

FARM UNIT.

August 10, 1906.—Under the authority conferred upon the Secretary of the Interior by the act of June 27, 1906, to fix a lesser area than 40 acres as the minimum entry and to establish farm units of not less than 10 or more than 160 acres as to all lands withdrawn and entered under the provisions of the reclamation act, he may make such subdivisions of the public lands entered under the reclamation act as in his judgment may be deemed advisable in units of 10 acres, or multiples thereof, up to 160 acres. (35 L. D., 110.)

FEES AND COMMISSIONS ON WATER-RIGHT APPLICATIONS AND PAYMENTS.

December 26, 1906.—Registers and receivers are not entitled to fees in connection with the filing of applications for water rights, but are each entitled to a commission of 1 per cent on all moneys received from water users at the office for which they are appointed to the extent of the maximum salary fixed by law. (35 L. D., 357.)

FORCE ACCOUNT WORK.

FURNISHING TRANSPORTATION TO LABORERS.

August 14, 1907.—Transportation may be furnished laborers from the place of entering into contracts for service to the place where their services are to be rendered as a part of the consideration for such services.

PURCHASE OF LANDS.

COMPENSATION OF ENTRYMEN FOR LANDS TAKEN.

March 11, 1907.—The rights of an entryman as to the measure of compensation and the character of the action that may be taken by the Government in acquiring or appropriating the land embraced in his entry for use in the construction and operation of irrigation works under the reclamation act must be determined by the status of the entry at the time of the withdrawal of the lands for such pur-

poses. And where the entryman at the time of the withdrawal had earned title to the land by full compliance with the homestead law, he is entitled to compensation for the land and the improvements thereon as fully as if the legal title had passed to him, but no evidence of title either equitable or legal will be issued. (35 L. D., 459.)

PRESCRIPTIVE TITLE TO CANAL RIGHT OF WAY.

December 22, 1906.—Form of contract for the purchase of lands may be modified in exceptional cases in the purchase of canal right of way to be an agreement to secure a prescriptive title to such right of way. Instances when this may be done are limited to the purchase of canal right of way which has been held in the possession of the grantor for a period of time in excess of the statutory requirements relative to perfecting a prescriptive title.

LANDS IN PRIVATE OWNERSHIP.

SUPPLYING ADDITIONAL WATER TO PARTIALLY IRRIGATED LANDS.

October 11, 1906.—Additional water may be supplied from reservoirs constructed under the reclamation act as may be necessary to fully develop and reclaim partially irrigated lands in private ownership, provided no restriction of the reclamation act is violated and the applicant becomes a member of the local water users' association. (35 L. D., 222.)

WATER RENTALS.

December 6, 1906.—During the construction of a Government project the temporary use of the canals of an irrigation system purchased by the Government for conveying water to lands that would otherwise be allowed to go to waste is not incompatible with the purpose, but is directly in pursuance of the object for which the property was acquired.

WITHDRAWAL OF LANDS.

MINERAL LANDS.

October 6, 1906.—Lands valuable for mineral deposits contained therein, although embraced within the limits of a withdrawal of lands susceptible of irrigation from any contemplated works, are not affected by such withdrawal. Hence the privilege of exploring for minerals in such lands remains in full force notwithstanding the withdrawal. However, lands withdrawn for the construction and operation of irrigation works rest upon a different principle and are not subject to any lien or claim other than a vested right existing prior to the inception of such withdrawal. (35 L. D., 216.)

TEMPORARY WITHDRAWALS DISCONTINUED.

June 29, 1907.—The practice of designating certain withdrawals made under the reclamation act as "temporary" will be discontinued. (35 L. D., 649.)

YAKIMA INDIAN RESERVATION.

August 10, 1906.—Under the provisions of the act of March 6, 1906, authorizing the disposition of such surplus and allotted lands on the Yakima Indian Reservation as may be subject to irrigation by means of projects under the reclamation act, 20 acres is fixed as the unit for Indian ownership to be irrigated by the waters of any subproject, and if an Indian desires to accept the benefits of the act and place his surplus lands under the control of the Government to be sold for his benefit, he can do so only upon the condition that he will retain 20 acres thereof and no more, for which a water right shall be secured to him appurtenant to the land and subject to the same charge for construction and annual charge for maintenance as other lands under the project. (35 L. D., 110.)

WATER USERS' ASSOCIATIONS.

The following water users' associations have been organized for cooperation with the United States under the provisions of the act of Congress approved June 17, 1902. (32 Stat. L., 388.)

Belle Fourche Valley, Belle Fourche, S. Dak.
Buford-Trenton, Buford, N. Dak.
Elephant Butte, Las Cruces, N. Mex.
El Paso Valley, El Paso, Tex.
Finney County, Garden City, Kans.
Klamath, Klamath Falls, Oreg.
Lower Milk River Valley, Malta, Mont.
Lower Yellowstone, Sidney, Mont.
North Platte Valley, Scotts Bluff, Nebr.
Okanogan, Alma, Wash.
Orland Water Users' Association, Orland, Cal.
Payette-Boise, Caldwell, Idaho.
Pecos, Carlsbad, N. Mex.
Rio Hondo, Roswell, N. Mex.
Salt River Valley, Phoenix, Ariz.
Strawberry Valley, Spanish Fork, Utah.
Sun River, Great Falls, Mont.
Sunnyside, North Yakima, Wash.
Tieton, North Yakima, Wash.
Umatilla, Hermiston, Oreg.
Uncompahgre, Montrose, Colo.
Williston, Williston, N. Dak.
Yuma County, Yuma, Ariz.

LITIGATION.

ARIZONA.

Salt River project.—No further action has been taken in the suits against Charles W. Williams and C. C. Gish, since the publication of the fifth annual report.

At the instigation of the Salt River Valley Water Users' Association proceedings were commenced early in 1907 in the district court of the third judicial district of Arizona under the title of Hurley *v.* Abbott et al., for the purpose of determining individual water rights of landowners in the Salt River Valley, who claimed, by virtue of appropriation, the right to use for irrigation the natural flow of Salt River.

The suit was heard May 23, and on June 10, 1907, the United States attorney in behalf of the Federal Government appeared in

court and requested permission to intervene on behalf of the Indians; thereupon the trial of the cause was continued until September 23, 1907, the Government being given until September 1 to file and serve papers.

Yuma project.—After rejection by the Irrigation Land and Improvement Company of repeated propositions by the Reclamation Service for purchase of right of way for construction of the Yuma dike, the company was notified on November 9, 1905, that the Government proposed to construct a canal over its land and claim right of way under the act of August 30, 1890 (26 Stat. L., 391). The contractors, Miller & Peasley, accordingly began the construction of the dike and canal, whereupon the Irrigation Land and Improvement Company applied for a temporary injunction restraining the contractors from further work. This was granted on November 11, 1905, by the commissioner of the Territorial district court at Yuma, Ariz. On November 16 Judge Campbell, holding court at Tucson in the first judicial district of Arizona, dissolved the injunction and later denied another injunction suit by the plaintiffs. On November 8, 1905, the company instituted suit in the supreme court of the District of Columbia, seeking to enjoin the Government from constructing any works across their lands. The United States filed a demurrer in January, 1906, and on June 14, 1906, the bill was dismissed for want of jurisdiction. On December 13, 1906, the case was submitted to the court of appeals of the District of Columbia and on January 9, 1907, the court held that, as the title to lands in Arizona was the principal question involved, the suit could not be maintained in this jurisdiction, following the doctrine laid down in the cases of the Northern Indiana Railroad Company *v.* the Michigan Central Railroad Company (15 How., 232) and the Columbia National Sand Dredging Company *v.* Morton (28 D. C. App., 288), and affirmed the decree of the supreme court of the District of Columbia sustaining a demurrer to and dismissing a bill for injunction.

The case has been taken to the Supreme Court of the United States and is on the docket of that court for the present term.

COLORADO.

Uncompahgre Valley project.—On September 29, 1905, suit was brought by the receiver of the Denver Savings Bank to secure possession of property mortgaged to the bank by the Taylor-Moore Construction Company, defaulting contractor for construction of the Gunnison tunnel. A writ of replevin was issued October 5, 1905, but on October 10, 1905, an order was issued restraining the plaintiff from interfering with the property. On October 10, 1906, an application was filed to appeal the case to the United States circuit court. On October 16, 1906, a transcript of the record from the district court was filed and the case set for hearing September 3, 1907.

NEBRASKA-WYOMING.

North Platte project.—The suit of H. G. Leavitt against the United States is pending in the district court of the United States, no further action having been taken since the filing of papers in that court.

Condemnation proceedings for approximately 240 acres of land located in the diversion dam site at Whalen, Wyo., have been begun in the United States district court of Wyoming. Order of condemnation was secured and appraisement had, from which the United States appealed for a jury trial. The proceedings will be heard at the November term of that court.

NEVADA.

Truckee-Carson project.—The cases of Vandall *v.* Malley and Tevis v. Malley, noted in the fifth annual report, have been dismissed.

Suits of ejectment were brought in 1905 against 7 persons who were engaged in the liquor business upon public land at Hazen, Nev. Verdict in each case was given for the Government and the public land vacated.

The Rickey Land and Cattle Company, a Nevada corporation, filed an application in the General Land Office for a reservoir right of way over the Alkali reservoir site, which application was rejected by that Office February 20, 1904.

On October 11, 1904, the Secretary of the Interior dismissed an application of the company for a writ of certiorari upon the denial of appeal from the finding of the General Land Office. The lands comprising this reservoir site were withdrawn under the second form of withdrawal September 30, 1902, and under the first form of withdrawal August 20, 1904. In April, 1906, it having been brought to the attention of the Government representatives that the company had begun the construction of three canals and a tunnel in the reservoir site, thus threatening to prevent its utilization by the Government, a complaint against the offending company was filed and an application made on September 4 for an injunction pendente lite. The court denied the application and directed that notice be given and a hearing had before the grant of a temporary injunction. A decision in this matter is being awaited.

NEW MEXICO.

Hondo project.—Two complaints were filed in the district court of Chaves County, N. Mex., on February 4, 1907, by Rufus J. Donnahoo and T. M. Daniel, separately, against W. M. Reed et al. The facts in both cases were practically the same, both the plaintiffs claiming from Hondo River water rights whose application was to be made below the diversion dam of the Hondo reservoir. On February 22, 1907, the court issued an order dismissing both cases for lack of jurisdiction, it having been shown that the defendants were only nominal ones while the real party in interest was the United States.

On February 14, 1907, suit was brought in the United States court at Alamogordo, N. Mex., against Lillie C. Klasner, claiming that the defendant was attempting to divert water on the north side of Hondo River above the Government dam in opposition to the latter's filings for water rights under the Hondo project. A temporary injunction restraining the defendant from diverting any water was issued March 11, 1907, also an order to show cause why the injunction should not be made permanent. The case was heard on this issue May 29, 1907, at which time a postponement was granted the defendant and the case

continued until the November term. In July the defendant filed a motion to dissolve the temporary injunction and the case came up for hearing July 25, at Alamogordo, N. Mex. Evidence was introduced by both litigants and on July 27 the court issued an order modifying the injunction to allow two irrigations of some land on the south side of the river owned by the defendant, the injunction as modified to remain in force until final hearing at the November term.

SOUTH DAKOTA.

Belle Fourche project.—The United States on July 13, 1906, filed a proceeding in condemnation in the United States district court to secure approximately 92 acres of land belonging to the Belle Fourche Land and Cattle Company and located in the diversion dam site at Belle Fourche, S. Dak. On September 10, 1906, the matter was settled by agreement out of court.

WASHINGTON.

Yakima project.—December 12, 1906, a settlement of the Cascade Canal Company action was effected by an agreement between the company and the Government, through which the former is entitled between March 15 and July 20 of each year to 150 second-feet of water from the flood waters of the Yakima River. From July 20 to October 15 of each year the company shall receive from storage a total of 16,800 acre-feet of water, and from the latter date until March 15 of the succeeding year 30 second-feet of water for stock and domestic purposes. By the terms of the agreement the Government acquires the dam constructed by the company at the outlet of Lake Kachess and a further consideration of $10,000, payable in five equal annual installments, beginning January 1, 1909.

In the United States district court for the eastern district of Washington the United States filed a complaint December 31, 1906, against Christian Hansen for the restoration of certain lands whose possession the defendant was unlawfully withholding from the Government. The defendant filed his answer April 3, 1907, claiming equitable title to the lands by virtue of fifteen years' residence and upon this assertion demanding a decree to that effect. April 8, 1907, the United States filed a demurrer to this answer. The case was heard upon oral argument before the court June 14, 1907, when written briefs were requested. The case is now pending.

June 14, 1907, a hearing was had upon a proceeding commenced April 9, 1907, in the United States district court for the eastern district of Washington by the United States against Thomas Ambler et al. for the condemnation of 241.56 acres of land bordering on Lake Clealum, and needed for construction purposes. At this hearing counsel for the defendants entered objection to the power of the United States to condemn these lands for the described purposes, also to matter of procedure, and the case was taken under advisement by the court. The suit was reopened October 21, and on October 25, 1907, a decree was rendered awarding $3,682, as against $17,607.50 first asked by the defendants, for the 241.56 acres involved. This corresponds closely with the price heretofore paid for unimproved land in that vicinity, and is satisfactory to the Government.

PURCHASES OF RIGHTS OR PROPERTY.

Section 7 of the reclamation act provides that where, in carrying out the provisions of the act, it is necessary to acquire any rights or property the Secretary of the Interior may acquire them for the United States by purchase or by condemnation through judicial process.

The following is a complete list of all such completed purchases to June 30, 1907, except as heretofore reported in the Fourth Annual Report, page 36, and in the Fifth Annual Report, page 32:

SALT RIVER PROJECT, ARIZONA.

Vendor.	Description.	Considera-tion.	Date of deed.
Allen, George A	S. ½ of SE. ¼ sec. 17, NE. ¼ of NE. ¼ sec. 20, and NW. ¼ sec. 21, T. 4 N., R. 12 E., G. and S. R. M.	$800.00	May —, 1904
Baker, John H., sr	S. ½ SW. ¼ sec. 14 and N. ½ of NW. ¼ sec. 23, T. 4 N., R. 12 E., G. and S. R. M.	3,000.00	May —, 1904
Botticher, Christian	SE. ¼ SE. ¼ sec. 21 and SW. ¼ SW. ¼ sec. 22, T. 5 N., R. 11 E., G. and S. R. M.	2,500.00	Sept. —, 1904
Cline, W. F., and Sarah L.	W. ½ NW. ¼ sec. 19, T. 4 N., R. 13 E., G. and S. R. M.	550.00	May —, 1904
Coleman, J. Irvin and Nellie L.	S. ½ SE. ¼ of SE. ¼ sec. 18, T. 4 N., R. 12 E., G. and S. R. M.	400.00	May —, 1904
Flippen, Jos. Thos., and May S.	N. ½ SE. ¼ N. ½ SE. ¼ of SE. ¼ sec. 18 and SW. ¼ SW. ¼ sec. 17, T. 4 N., R. 12 E., G. and S. R. M.	1,050.00	Aug. —, 1904
Fuss, Mary A. Bacon	S. ½ NE. ¼ sec. 30, T. 4 N., R. 13 E., G. and S. R. M.	1,200.00	June —, 1904
Grand Canal Co	Grand canal	20,488.00	June 15, 1906
	One-third interest in Water Power canal	5,243.34	
Hocker, Elizabeth A., and Nicholas.	S. ½ SW. ¼ NE. ¼ SW. ¼ and NW. ¼ SE. ¼ sec. 27, T. 4 N., R. 13 E., G. and S. R. M., together with water rights.	4,000.00	Oct. —, 1905
Hunt, George W	S. ½ SE. ¼ sec. 29, N. ½ NE. ¼ sec. 32, NE. ¼ NE. ¼ sec. 33, and S. ½ SE. ¼ sec. 28 (except 5 acres), all in T. 4 N., R. 13 E., G. and S. R. M.	6,525.00	June —, 1904
Kenton, Simon W	SE. ¼ NE. ¼ and NE. ¼ SE. ¼ sec. 35, T. 4 N., R. 13 E., G. and S. R. M.	3,500.00	Sept. —, 1904
Maricopa Canal Co	Maricopa canal	19,960.00	June 15, 1906
	One-sixth interest in Water Power canal	2,621.66	
	One-half interest in joint heading with Salt River Valley canal.	6,306.00	
Mechem, Joseph S	NE. ¼ NW. ¼ sec. 35, T. 5 N., R. 11 E., G. and S. R. M., 40 acres and water rights.	400.00	Sept. 10, 1906
Peter, George T	S. ½ SE. ¼ and NW. ¼ SE. ¼ sec. 27, T. 5 N., R. 11 E., G. and S. R. M., 120 acres.	1,600.00	Mar. 20, 1907
Salt River Valley Canal Co.	Salt River Valley canal	10,203.00	June 15, 1906
	One-sixth interest in Water Power canal	2,621.66	
	One-half interest in joint heading with Maricopa canal.	6,306.00	
Steele, Porter	Arizona canal	235,168.00	June 20, 1906
Water Power Canal Co.	One-third interest Water Power canal, etc	5,243.33	June 15, 1906
Williams, Mary A., and J. E.	W. ½ SW. ¼ sec. 26 and S. ½ SE. ¼ sec. 27, T. 4 N., R. 13 E., G. and S. R. M.	1,200.00	Nov. 24, 1906

YUMA PROJECT, CALIFORNIA-ARIZONA.

Arizona Ditch Co	Farmers levee and rights of way for same, extending from a point in sec. 29, T. 16 S., R. 22 E., S. B. M., to its end in sec. 31, T. 9 S., R. 24 W., G. and S. R. M.	$1,435.00	Jan. 8, 1907
Barkley, John G	W. ½ NW. ¼ and W. ½ SW. ¼ sec. 6, T. 7 S., R. 21 W., G. and S. R. M., Arizona, 160 acres.	900.00	June 5, 1907
Brown, A. H	Part of SE. ¼ sec. 24, T. 8 S., R. 22 W., G. and S. R. M.	105.00	May —, 1907
Do	Part of NW. ¼ NW. ¼ sec. 32, T. 16 S., R. 22 E., S. B. M., 0.5 acre.	5.00	May —, 1907
Colby, R. V., and husband.	Part of NW. ¼ SW. ¼ sec. 19, T. 8 S., R. 21 W., G. and S. R. M., 9 acres.	225.00	Mar. 23, 1907
Do	Part of S. ½ sec. 19 and NE. ¼ NE. ¼ sec. 30, T. 8 S., R. 21 W., G. and S. R. M., 24 acres.	240.00	Mar. 9, 1907
Donington, Jno. W	Lots 2 and 3 and south 20 feet of lot 1, block 55, town and county of Yuma.	72.60	Oct. 30, 1906
Edwards, Nelson T., and wife.	Part of SW. ¼ sec. 33, T. 8 S., R. 24 W., G. and S. R. M., Arizona, 9.4 acres.	94.00	Oct. 31, 1906
Espinoza, Manuel	Part of sec. 14, T. 8 S., R. 22 W., G. and S. R. M., 1 acre.	10.00	Feb. 28, 1907

YUMA PROJECT, CALIFORNIA-ARIZONA—Continued.

Vendor.	Description.	Consideration.	Date of deed.
Harris, John M., and wife.	Part of SE. ¼ sec. 22, T. 8 S., R. 22 W., G. and S. R. M., 6 acres.	$60.00	Feb. 20, 1907
Harris, Wm. O., and wife.	Part of S. ½ SW. ¼ sec. 28 and S. ½ SE. ¼ sec. 29, T. 16 S., R. 22 E., S. B. M., 22.1 acres.	552.50	July 2, 1906
Henry, Joseph R.....	Part of NW. ¼ sec. 15, T. 8 S., R. 22 W., G. and S. R. M., 4.2 acres.	42.00	Feb. 27, 1907
Inglis, Ervin A., and wife.	Strip across NW. ¼ NE. ¼ sec. 31, T. 16 S., R. 22 E., Yuma County, Ariz., 4.7 acres.	47.00	Apr. 6, 1907
Johnson, Neil.....	Part of sec. 22, T. 8 S., R. 22 W., G. and S. R. M., 8 acres.	80.00	Feb. 19, 1907
Karr, Lawrence E., and wife.	Strip of land across lot 4 and SW. ¼ SW. ¼ sec. 22, and lot 2 sec. 21, T. 8 S., R. 24 W., G. and S. R. M., Arizona, 8.8 acres.	88.00	Mar. 9, 1907
Keppler, Frank.....	Part of SW. ¼ sec. 15, T. 8 S., R. 22 W., G. and S. R. M., 6.1 acres.	61.00	Feb. 19, 1907
Latham, Jno. W.....	Part of lot 4 and SW. ¼ SE. ¼ sec. 28, T. 8 S., R. 24 W., G. and S. R. M., Arizona, 7.7 acres.	77.00	Sept. 8, 1906
Parks, Hiram B., and wife.	Strip of land across E. ½ NE. ¼ sec. 28, T. 8 S., R. 24 W., G. and S. R. M., 6.1 acres.	61.00	Oct. 30, 1906
Rathbun, Betty.....	Strip of land across N. ½ NW. ¼ sec. 31, T. 16 S., R. 22 E., S. B. M., 9.1 acres.	91.00	Jan. 17, 1907
Timmons, W. F., and wife.	Strip of land across SE. ¼ NW. ¼ sec. 8, T. 9 S., R. 24 W., G. and S. R. M., 4.5 acres.	54.00	Feb. 14, 1907
Webb, Anderson B., and wife.	Strip of land across lot 5, sec. 5, and lots 2 and 3, sec. 8, T. 9 S., R. 24 W., G. and S. R. M., 9.8 acres.	98.00	Dec. 6, 1906
Winsor, Walter, and wife.	Part of sec. 15, T. 8 S., R. 22 W., G. and S. R. M., 10 acres.	100.00	Feb. 16, 1907
Yuma, town of.....	Right of way, 220 feet wide through blocks 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 48, and 51.	150.00	Sept. 7, 1905
	MINIDOKA PROJECT, IDAHO.		
Hunt, Liberty I., and wife.	"Buttercup" mining claim in secs. 22 and 23, and "Basalt" and "Headlight" placer mining claims in sec. 23, T. 9 S., R. 27 E., B. M., which may be submerged by back water caused by construction of Minidoka dam, 62.39 acres.	$1,400.00	Aug. 23, 1906
Lish, Francis Ethelda..	Part of lots 2 and 3 and N. ½ SE. ¼ sec. 19, T. 9 S., R. 28 E., B. M., 9.8 acres.	1,500.00	Nov. 14, 1906
Steele, Orville R.....	"March Morning" mining claim in sec. 25, T. 9 S., R. 23 E., B. M., improvements and portion of claim will be submerged by backwater from dam on Snake River.	800.00	July 24, 1906
	PAYETTE-BOISE PROJECT, IDAHO.		
Chaney, Jas. R., and wife.	NE. ¼ sec. 29, T. 3 N., R. 3 W., B. M., 160 acres....	$3,400.00	Nov. 30, 1906
Coe, Alma J.....	Improvements on homestead entry 7583, NE. ¼ sec. 32, T. 3 N., R. 3 W., B. M., land required for Deer Flat reservoir.	75.00	Sept. —, 1906
Coe, Chas. E., and wife.	NW. ¼ sec. 33, T. 3 N., R. 3 W., B. M., 160 acres....	3,780.00	Jan. 9, 1907
Hinkey, Antone, and wife.	Part of E. ½ SW. ¼ sec. 9, T. 2 N., R. 2 W., B. M., 43 acres.	645.00	Dec. 12, 1906
Horner, Fred A., and wife.	Improvements on SW. ¼ SE. ¼ sec. 26, T. 3 N., R. 3 W., B. M., homestead entry 7732, land taken for Deer Flat reservoir.	175.00	Oct. —, 1906
Hurtt, Jay W., and Annie M.	Damages to homestead entry by digging borrow pits for Deer Flat reservoir.	129.00	Oct. —, 1906
Jones, Margaret E.....	S. ½ NE. ¼ sec. 35, T. 3 N., R. 3 W., B. M., 80 acres..	4,660.00	June —, 1907
Lore, C. E., and wife...	S. ½ NE. ¼ SE. ¼ and part of NE. ¼ SW. ¼ and W. ½ SE. ¼ sec. 33, T. 3 N., R. 3 W., B. M.	2,125.00	Jan. 7, 1907
Lynch, Mrs. Julia.....	N. ½ of NE. ¼ of sec. 35, T. 3 N., R. 3 W., B. M., 80 acres.	4,800.00	Apr. —, 1906
Mahaffey, Thomas F...	W. ½ SW. ¼ sec. 27, T. 3 N., R. 3 W., B. M., 80 acres (relinquished).	150.00	Nov. 3, 1906
Pleasants, Wm. A. and Francis A.	SW. ¼ NE. ¼, SE. ¼ NW. ¼, lots 4 and 5, except SW. 10 acres in sec. 6, T. 2 N., R. 2 W., B. M., 97 acres, land for Deer Flat reservoir.	1,455.00	July —, 1906
Richards, Frank W....	E. ½ SW. ¼ sec. 1, T. 2. N., R. 3 W., B. M., 80 acres for Deer Flat reservoir.	8,500.00	Apr. —, 1906
Richards, Wm. H., and wife.	Part of E. ½ NW. ¼ sec. 12, T. 2 N., R. 3 W., B. M., lying below flow line of Deer Flat reservoir, 38 acres.	4,500.00	Do.
Smith, Charles S., and Artie F. Smith.	Improvements on H. E. for NE. ¼ sec. 30, T. 3 N., R. 3 W., B. M., 160 acres (relinquished and canceled).	800.00	Nov. 12, 1906
Ward, Isaiah B., and wife.	Part of N. ½ SE. ¼ sec. 3, T. 2 N., R. 3 W., B. M., 33 acres.	1,000.00	Jan. 26, 1907

ST. MARY PROJECT, MONTANA.

Vendor.	Description.	Consideration.	Date of deed.
Octavia Gulick.....	Improvements and rights on 160 acres of Blackfeet Indian Reservation on east side of Lower St. Mary Lake.	$800.00	Feb. 15,1907

NORTH PLATTE PROJECT, NEBRASKA-WYOMING.

Earnest, Boney, and wife.	S. ½ NE. ¼ and N. ½ SE. ¼ sec. 35, T. 29 N., R. 84 W., sixth principal meridian, 160 acres; E. ½ SE. ¼, SE. ¼ NE. ¼ sec. 7; SW. ¼ NW. ¼ sec. 8, T. 28 N., R. 84 W., sixth principal meridian, 160 acres; SW. ¼ N. ½ SE. ¼ and SW. ¼ SE. ¼ sec. 8; NW. ¼ sec. 17; NE. ¼ NE. ¼ sec. 18, T 28, N., R. 84 W., 480 acres; SE. ¼ E. ½ SW. ¼ and S. ½ NE. ¼ sec. 18, T. 28 N., R. 84 W., 320 acres, all in Wyoming.	$28,000.00	Feb. 24,1906
Fritz, John George....	Right of way through NE. ¼ sec. 9, T. 24 N., R. 56 W., sixth principal meridian, Nebraska, 18 ½ acres.	273.75	(?)
Julian, Frank.....	S. ½ SW. ¼ sec. 26, SE. ¼ SE. ¼ sec. 27 and NW. ¼ NW. ¼ sec. 35, T. 29 N., R. 84 W., sixth principal meridian, Natrona County, Wyo., 160 acres.	1,800.00	Feb. 24,1906
Lincoln Land Co.....	Lots 4, 5, and 6, block 2, of original town of Mitchell, Nebr.	300.00	Nov. 14,1906
Mecay, Alva C., and wife.	SE. ¼ sec. 29, T. 23 N., R. 53 W., sixth principal meridian, 160 acres.	1,593.28	Dec. 12,1906
Weaver, William H....	W. ½ NE. ¼ and E. ½ NW. ¼ sec. 19, T. 28 N., R. 84 W., sixth principal meridian; lots 3 and 4 sec. 18 and lots 1, 2, 3, and 4 sec. 19, T. 28 N., R. 84 W., sixth principal meridian; S. ½ sec. 13; all sec. 24 and NW. ¼ NW. ¼ sec. 25, T. 28 N., R. 85 W., sixth principal meridian, 1,400 acres.	36,400.00	Feb. 24,1906
Wolf, Luwilda, and husband.	E. ½ SW. ¼ sec. 33, T. 29 N., R. 84 W., and lot 1, SE. ¼ NE. ¼ sec. 4, T. 28 N., R. 84 W., sixth principal meridian, Wyoming, 160 acres.	700.00	Do.
Wolf, Marion, and wife.	E. ½ NE. ¼ sec. 29, SW. ¼ NW. ¼ and NW. ¼ SW. ¼ sec. 28, T. 29 N., R. 84 W., sixth principal meridian, 160 acres.	2,400.00	Do.

WILLISTON PROJECT, NORTH DAKOTA.

Boltz, Rudolph.....	N. ½ N. ½ SW. ¼ NE. ¼ and S. ½ S. ½ NW. ¼ NE. ¼ sec. 7, T. 154 N., R. 100 W., fifth principal meridian, 20 acres.	$430.00	Apr. 1,1907
Bruegger Mercantile Co.	Lot at SE. corner Fourth street and Rounsavelle avenue, Williston, fronting north 150 feet on Fourth street and west 150 feet on Rounsavelle avenue, and depth of 150 feet, 10 feet to be taken from avenue-dimension for alley.	350.00	Do.
Wegley, Joseph.....	Damages to improvements on homestead entry 42, SW. ¼ NE. ¼ sec. 24, T. 154 N., R. 101 W., fifth principal meridian, by construction and operation of canal.	100.00	

BUFORD-TRENTON PROJECT, NORTH DAKOTA.

Braman, Lucius W.....	Strip 20 rods wide along west side of lot 3: a strip 20 rods wide along east side of lot 4, and a parcel 30 rods square in the SE. corner of SW. ¼ NW. ¼, all in sec. 15, T. 152 N., R. 104 W., 15.4 acres.	$712.50	June 3,1907

LOWER YELLOWSTONE PROJECT, NORTH DAKOTA-MONTANA.

Northwestern Improvement Co.	Lots 4, 5, 8, 10, 11, and 12, sec. 1, T. 17 N., R. 56 E., M. P. M., 180.36 acres.	$473.40	Sept. 30,1906
Nelson, Robert P.....	Costs of removal of buildings from E. ½ NW. ¼ and NW. ¼ NE. ¼, sec. 19, T. 24 N., R. 60 E., M. P. M., made necessary by construction and operation of canal.	450.00	Juiy 19,1906

UMATILLA PROJECT, OREGON.

Vendor.	Description.	Consideration.	Date of deed.
Brown, Gideon R., and wife.	Part of SE. ¼ sec. 36, T. 5 N., R. 29 E., W. M., 60 acres.	$150.00	Nov. 24, 1906
Coffey, Alexander L....	Part of NW. ¼ NW. ¼ sec. 22, T. 3 N., R. 29 E., W. M., 2½ acres.	235.00	Feb. 1, 1907
Cunha, Jos., and wife...	Part of SE. ¼ of the SE. ¼ sec. 8, T. 3 N., R. 29 E., W. M., 6½ acres.	125.00	Feb. 13, 1907
Furnish, Wm. J., and wife, Jesse M. Furnish.	Sec. 1, T. 4 N., R. 29 E., W. M., 454.5 acres.....	4,235.00	May 14, 1907
Graham, Chas. E., and Birda Graham.	Relinquishment Hd. No. 12866, NE. ¼ sec. 12, T. 4 N., R. 29 E., W. M., 160 acres.	75.00	Apr. 24, 1907
Wilson, William H.....	Part of W. ½ SE. ¼ and E. ½ SW. ¼ sec. 22, T. 3 N., R. 29 E., W. M., 8¼ acres.	700.00	Apr. 17, 1907

KLAMATH PROJECT, OREGON.

Arant, H. L., and wife.	Damage to improvements on S. ½ SW. ¼ sec. 18, T. 39 S., R. 10 E., W. M.	$296.25	Oct. 26, 1906
Brett, John, and Lester F. Kirkpatrick.	Right of way for tunnel under lots 5 and 6, block 20, Fairview Addition No. 2 to Klamath Falls, Oreg.	50.00	Oct. 12, 1906
Little Klamath Water Ditch Co.	Irrigation ditch or canal in Klamath County, Oreg. extending from a point in sec. 15, T. 41 S., R. 10 E., W. M., to a point 174 feet south of the NW. corner sec. 10, T. 41 S., R. 11 E., W. M., commonly known as the Adams ditch or canal, together with water rights, rights of way, riparian rights, etc.	95,000.00	Oct. 15, 1906
McCormick, Thos., and wife.	Lots 1, 8, 9, 10, 11, 12, and 13 and NW. ¼ SE. ¼ and S. ½ SE. ¼ sec. 36, T. 39 S., R. 7 E., W. M.; also not exceeding 2 acres for a power house; total, 308.1 acres; also water rights.	10,000.00	Nov. 14, 1906
McMillan, Margaret...	Strip 150 feet wide through SE. ¼ of NE. ¼ sec. 3, T. 39 S., R. 9 E., W. M. (also paid $185 in lieu of wagon bridge under contract Mar. 15, 1907).	276.60	May 4, 1907
Meyer, Chas. N., and Charity E. Meyer.	Strips of land in W. ½ of SW. ¼, sec. 2, T. 39 S., R. 9 E., W. M., about 10 acres.	500.00	Jan. 28, 1907
Thomas, Mrs. Anna A.	Damage to improvements on part of N.E ¼ NW. ¼ sec. 19, T. 39 S., R. 10 E., W. M.	110.00	Aug. 9, 1906
Tule Lake Land and Livestock Co.	Lands and rights, including the Adams ditch, in Modoc County, Cal., and Klamath County, Oreg. (part payment).	183,600.00	Nov. 23, 1906
Winters, Herman J....	Part of lot 1, block 1, Shives Addition to Klamath Falls, Oreg.	35.00	Dec. 7, 1906

BELLE FOURCHE PROJECT, SOUTH DAKOTA.

Belle Fourche Land and Cattle Co.	Part of SW. ¼ NE. ¼, NW. ¼ SE. ¼, E. ½ SW. ¼, and SW. ¼ SW. ¼ sec. 2, also part of NW. ¼ sec. 11, T. 8 N., R. 2 E., 92.21 acres, also release of damages by backwater on 49.3 acres additional.	$11,000.00	Apr. 4, 1907
Giles, A., and wife.....	Parts of N. ½ NE. ¼ and N. ½ NW. ¼ sec. 33, W. ½ NW. ¼ sec. 34, S. ½ SW. ¼ sec. 29, and N. ½ NW. ¼ sec. 32, T. 9 N., R. 3 E., B. H. M., 38.07 acres.	1,537.20	Mar. 13, 1907
Haggstrom, Albert, and wife.	W. ½ SW. ¼ sec. 11 and N. ½ NW. ¼ sec. 14, T. 9 N., R., 3 E., B. H. M., and damages for loss of improvements.	185.00	Feb. 11, 1907
Holst, Wm. B., and wife and Francis E. Ford and wife.	Strip 100 feet wide through S. ½ SW. ¼ and S. ½ SE. ¼ sec. 6, T. 7 N., R. 6 E., B. H. M., 10.68 acres.	213.60	Apr. 11, 1907
J. M. Cattle Co.....	Part of NW. ¼ SE. ¼ and NE. ¼ SW. ¼ sec. 34, T. 9 N., R. 3 E., B. H. M., 19.5 acres.	585.00	Mar. 5, 1907
Langdon, Richard, sr., and Mary A. Langdon.	Strip 100 feet wide through E. ½ sec. 22, T. 8 N., R. 5 E., B. H. M.	491.00	Apr. 6, 1907
Malcolm, Geo., and James.	Strip 100 feet wide through S. ½ SE. ¼ sec. 29 and N. ½ NE. ¼ sec. 32, T. 9 N., R. 3 E., B. H. M., 12.9 acres.	387.00	Apr. 11, 1907
May, Louis.....	SE. ¼ SE. ¼ NW. ¼, NE. ¼ SW. ¼, and lots 2 and 3 sec. 31, T. 9 N., R. 4 E., B. H. M., 320 acres.	4,000.00	Mar. 14, 1907
Oliver, Geo., and wife..	Part of W. ½ NE. ¼ and N. ½ NW. ¼ sec. 26, T. 8 N., R. 5 E., B. H. M., 5.35 acres.	133.75	Mar. 21, 1907
Rickard, Walter.....	SW. ¼ SW. ¼ sec. 33, T. 10 N. R. 3 E., lots 2, 3, and 4, T. 9 N., R. 3 E., B. H. M., and damages for loss of improvements.	159.00	Dec. 26, 1906
Riggs, John C., and wife.	Part of S. ½ NW. ¼, lots 2, 3 and 4 sec. 2, T. 7 N., R. 5 E., 17.35 acres.	347.00	

BELLE FOURCHE PROJECT, SOUTH DAKOTA—Continued.

Vendor.	Description.	Consideration.	Date of deed.
Ross, Gust., and wife..	NE. ¼ sec. 24, S. ½ SE. ¼, S. ½ SW. ¼ sec. 13, T. 9 N., R. 3 E., B. H. M., for Owl Creek Reservoir.	$3,200.00	Sept. 18, 1905
Sorensen, Soren.....	Part of N. ½ NE. ¼ sec. 17, T. 78 N., R. 5 E., B. H. M., 16.88 acres.	337.60	Feb. 26, 1907
Wood, Chas. G., administrator of estate of Albert F. Wood.	Part of W. ½ SE. ¼ and E. ½ SW. ¼ sec. 12, T. 8 N., R. 4 E., B. H. M., 10.75 acres.	215.00	Mar. 27, 1907

OKANOGAN PROJECT, WASHINGTON.

Blackwell, George A., and wife.	Part of sec. 12, T. 35 N., R. 24 E., 43.98 acres; and lots 2 and 3 sec. 7, T. 35 N., R. 25 E., 35.75 acres; total, 79.73 acres.	$6,500.00	Nov. 5, 1906
Burke, Thomas.....	Lucky Strike, Silver Bluff, Sullivan; portion of east end of Horn Silver; portion east end Silver Spray and portions of Welcome Nugget and Gold Cup Lode Mining claims, known as lots 201-207 of U. S. mineral survey, Okanogan County, Wash., in NW. ¼ sec. 7 and SW. ¼ sec. 6, T. 35 N., R. 25 E., W. M., 102.62 acres.	5,125.00	Feb. 11, 1907
Cheetham, Mrs. S. J., and husband.	Part of mineral surveys 201 and 202, Salmon River mining district, 4.49 acres.	175.00	Sept. 10, 1906
Hanan, Endora J.....	Part of Horn Silver mining claim, Okanogan County, Wash., 4.15 acres.	550.00	Dec. 20, 1906
Herrmann, Charles.....	Lots 10 and 11 in block W, Conconully Mining Co.'s first addition to the town of Conconully, Wash.	150.00	Mar. 30, 1907.
McGillivray, D. J., and wife.	Undivided one-half of following lode mining claims: Silver Flood, Jay Eye See, Palo and Alta each containing 20.66 acres.	1,000.00	Feb. 8, 1907
Pendergast, E. K., and wife.	Undivided one-half of Silver Flood, Jay Eye See, Palo and Alta mining claims, 20.66 acres.	1,000.00	Jan. 26, 1907
Phelan, J. Jerry, and wife.	Lots 10, 11, 12, and 13 in block X, Conconully Mining Co.'s first addition to town of Conconully, Wash.	700.00	Mar. 30, 1907
Sayles, Ed.....	Lots 1 and 2, SE. ¼ NW. ¼ and NE. ¼ SW. ¼ sec. 18, T. 35 N., R. 25 E., W. M., 151.19 acres.	2,000.00	Dec. 13, 1906
Siegmann, Gustav.....	SE. ¼ SE. ¼ sec. 12, T. 35 N., R. 24 E.; lots 6 and 7, sec. 7, T. 35 N., R. 25 E., W. M., 114.7 acres.	5,000.00	Sept. 4, 1906
Snowden, James V.....	Conveyed all of lots 4, 5, 6, 7, 8, 9, and 14, block lettered "X," Conconully Mining Co.'s first addition to the town of Conconully, Okanogan County, Wash.	700.00	May 2, 1907
Spreuill, William M., and wife.	Lots 12, 13, 14, and 15 in block W, Conconully Mining Co.'s first addition to the town of Conconully, Wash.	650.00	Mar. 30, 1907
Weeks, George A., and wife.	SW. ¼ SE. ¼ sec. 12, T. 35 N., R. 24 E., W. M., 40 acres.	2,500.00	Nov. 5, 1906
Wilder, Hiram Arthur, and Mary Blanche, his wife.	Lots 4, 5, 6, and 7, block W, Conconully Mining Co.'s first addition to the town of Conconully, Okanogan County, Wash.	150.00	Apr. 21, 1907
Work, Leroy L., and Nellie S., his wife.	Lots 16, 17, 18, 19, block W; lot 3, block X; lots 4, 5, 6, 7, 8, 9, 10, 11, block Y, all in Conconully Mining Co.'s addition to the town of Conconully, Okanogan County, Wash.	530.00	May 2, 1907
Work, Leroy L., and wife.	Portions of Silver Spray and Horn Silver mining claims, Okanogan County, Wash., 3.8 acres.	380.00	Sept. 5, 1906

YAKIMA DISTRICT PROJECTS, WASHINGTON.

Aumiller, W. J., and wife.	Lots 1 and 2, block 268, Ker's second addition to North Yakima.	$1,600.00	Nov. 10, 1906
Braun, John N., and wife.	Part of NW. ¼ SE. ¼ sec. 34, T. 21 N., R. 14 E., W. M. 3.4 acres.	75.00	Mar. 2, 1907
Cascade Canal Co.....	All right, title, and interest in Kachess dam at outlet of Lake Kachess in sec. 34, T. 21 N., R. 13 E., W. M., unsurveyed.	Compromise.	Dec. 12, 1906
Cobb, Addison.....	Right of way for wagon road across sec. 9, and the S. ½ NW. ¼, NE. ¼ NW. ¼, and NW. ¼ NE. ¼ sec. 10, all in T. 14 N., R. 16 E., W. M., subject to termination 4 years from date.	$500.00	Sept. 11, 1906
Davis, Chas. M.....	SE. ¼ sec. 28, T. 21 N., R. 14 E., W. M., 161.85 acres..	4,000.00	Oct. 31, 1906
Gale, J. W., and wife...	Improvements on sec. 8, T. 21 N., R. 13 E., W. M., unsurveyed.	2,500.00	Dec. 14, 1906

YAKIMA DISTRICT PROJECTS, WASHINGTON—Continued.

Vendor.	Description.	Consideration.	Date of deed.
Little, A. L., and wife..	Right of way for wagon road across SW. ¼ sec. 8, T. 14 N., R. 16 E., W. M.	$1.00	July 27, 1906
Morgiel, Frank E., and wife.	NE. ¼ NE. ¼ and lots 1, 2, and 3, sec. 20, T. 21 N., R. 14 E., W. M., 155 acres.	2,825.00	Oct. 5, 1906
McConihe, Lucien F., and wife.	Lot 2, sec. 34, T. 12 N., R. 14 E., W. M., 13.20 acres..	185.00	Feb. 19, 1907
Natches Land and Cattle Co.	Right of way for wagon road across sec. 35, T. 15 N., R. 16 E., W. M., terminable in 4 years.	1.00	Aug. 8, 1906
Noble, John.....	A portion of the SE. ¼ of NW. ¼ and lots 1 and 3 of sec. 28, T. 21 N., R. 14 E., W. M., 60.33 acres.	909.95	Apr. 19, 1907
Sinclair, Daniel, and wife.	Right of way for wagon road across sec. 3, T. 14 N., R. 16 E., W. M., and the SW. ¼ NE. ¼ and S. ½ NW. ¼ sec. 2, T. 14 N., R. 16 E., W. M.	1.00	Aug. 21, 1906
Templeman, Fred A...	Right of way across the S. ½ NW. ¼ sec. 2, T. 14 N.. R. 16 E., W. M.	75.00	Aug. 8, 1906
Union Gap Irrigation Co.	Lot 1 in sec, 10, T. 20 N., R. 14 E., W. M.....	1.00	Aug. 20, 1906
Washington Irrigation Co.	Sunnyside canal, in Yakima and Benton counties, Wash., together with all water rights of the said company, and all its sub-laterals, feeders, flumes, head gates, sluiceways; also all maps, plans, and field notes relative to said system, the land occupied by its headquarters building in Zillah, and the buildings thereon; all patrol houses, telephone lines, rights of way, and all other structures and property and rights, both real and personal, in any way thereunto pertaining or used in connection with the said Sunnyside canal and irrigating system, except the construction outfit of said company.	235,072.00	June 23, 1906
Weddle, J. S., and wife.	Right of way for wagon road across the S. ½ NE. ¼ and N. ½ SE. ¼ sec. 8, T. 14 N., R. 16 E., W. M.	1.00	July 27, 1906
Yakima County.....	Franchise for right of way for telephone line on county roads Nos. 26, 65, 229, and State road No. 1.	Gratis.	Mar. 4, 1907

SHOSHONE PROJECT, WYOMING.

Arnold, Harrison P. and wife.	Part of S. ½ SW. ¼ sec. 24, T. 52 N., R. 103 W., sixth principal meridian, containing 15 acres.	$525.00	Jan. 2 1907
MacGlashan and McKellar.	Lease of NW. ¼ NE. ¼ sec. 23, T. 52 N., R. 103 W., sixth principal meridian, and purchase of buildings on said land.	6,750.00	Apr. 3, 1907
Riddle, Stilley T., and wife.	NE. ¼ SW. ¼ sec. 25, T. 52 N., R. 103 W., sixth principal meridian, 40 acres.	1,800.00	July 30, 1906
Thurmond, Henry L. (unmarried.)	S. ½ SW. ¼ sec. 23; N. ½ NW. ¼ sec. 26; W. ½ SE. ¼ sec. 24, and the W. ½ NE. ¼ sec. 25, all in T. 52 N., R. 103 W., sixth principal meridian, 320 acres.	8,000.00	Apr. 1, 1907
Tinkcom, Lilian, and husband.	NE. ¼ SE. ¼ sec. 23. T. 52 N., R. 103 W., sixth principal meridian, 40 acres.	1,600.00	July 25, 1906
Wilcox, James L., and wife.	1 acre of land in NW. ¼ SW. ¼ sec. 12, T. 52 N., R. 103 W., sixth principal meridian.	3,500.00	Oct. 29, 1906
Williams, Marian, and husband.	SW. ¼ SW. ¼ sec. 26, T. 52 N., R. 103 W., sixth principal meridian, 40 acres.	850.00	Aug. 1, 1906

TRANSPORTATION OFFICE.

The establishment of an office in Chicago to handle the transportation of material, machinery, and supplies used in reclamation work has proved to be of much benefit to the Service in securing empty equipment for loading machinery, material, and supplies, in accelerating the movement of freight, in securing general contracts and special concessions in freight rates, in making and collecting claims against transportation companies, and in making administrative examination on bills for charges on Reclamation Service freight.

The following transportation companies have executed general freight contracts with the Department of the Interior, providing for the lowest of (*a*) any special commodity rate published; (*b*) Pacific coast terminal rates as shown in transcontinental tariffs to apply to

all project points; (*c*) tariff rates, less legal land-grant deductions; (*d*) 50 per cent of any published class rate:

Railroads that have made general freight contracts.

	Date.
Atchison, Topeka and Santa Fe Railway	Feb. 16, 1906
Chicago, Burlington and Quincy Railroad Company	May 1, 1905
Chicago, Milwaukee and St. Paul Railway Company	Sept. 5, 1905
Chicago and Alton Railway Company	Apr. 3, 1906
Chicago, Great Western Railway Company	Sept. 6, 1906
Chicago and Eastern Illinois Railway Company	Oct. 12, 1905
Chicago, St. Paul, Minneapolis and Omaha Railway Company	Oct. 15, 1906
Chicago, Rock Island and Pacific Railway Company	June 1, 1905
Chicago, Rock Island and Gulf Railway Company	June 1, 1905
Chicago, Rock Island and El Paso Railway Company	June 1, 1905
Chicago and Northwestern Railway Company	Aug. 1, 1906
Fort Worth and Rio Grande Railway Company	Aug. 17, 1906
St. Louis and San Francisco Railroad Company	Aug. 15, 1905
Gila Valley, Globe and Northern Railway Company	May 20, 1905
Great Northern Railway Company	May 18, 1905
Illinois Central Railroad Company	May 24, 1905
Maricopa and Phoenix and Salt River Valley Railroad	May 20, 1905
Northern Pacific Railway Company	May 8, 1905
Oregon Railroad and Navigation Company	May 22, 1905
Oregon Short Line Railroad	May 22, 1905
Paris and Great Northern Railroad	Aug. 17, 1906
San Pedro, Los Angeles and Salt Lake Railroad Company	Aug. 20, 1906
Southern Pacific Company	May 22, 1905
Southern Pacific, Atlantic System:	
Galveston, Harrisburg and San Antonio Railway Company	June 15, 1905
Galveston, Houston and Northern Railway Company	
Southern Pacific Company Atlantic Steamship Lines	
Texas and New Orleans Railway Company	
Morgan's Louisiana and Texas Railroad and Steamship Company	
Louisiana Western Railroad	
Minneapolis, St. Paul and Sault Ste. Marie Railway Company	May 1, 1905
St. Louis, San Francisco and Texas Railway	Aug. 17, 1906
St. Louis, Kansas City and Colorado Railroad	June 1, 1905
Union Pacific Railroad	May 22, 1905

All of the above contracts apply to machinery and material used in reclamation work.

On March 1, 1906, the Atchison, Topeka and Santa Fe Railway Company made a special rate of 30 cents per hundred pounds on lumber in carload lots from sawmill points on the Gulf, Colorado and Santa Fe Railway to Carlsbad, N. Mex. On November 14, 1905, the same company conceded a rate of 15 cents per hundred pounds on cement in carload lots from Iola and Independence, Kans., to Carlsbad, N. Mex.

The Chicago, Burlington and Quincy Railroad Company has made the following rates. On July 22, 1905, a special rate on stock in carload lots, from and to all points, of 50 per cent of commodity rates. On January 11, 1906, on cement in carloads of 60,000 pounds, from Chicago to Cody and Corbett, Wyo., a rate of 40.88 cents per hundred pounds was conceded. On April 14, 1906, on lumber in carload lots, from Denver to all points on the Guernsey branch, a rate of 21.5 cents per hundred pounds was made. On November 2, 1906, on grain in bulk in carload lots, the same rate was made as obtained on grain in sacks, from and to all points on the Guernsey branch. On February 15, 1907, on cement in carloads of 60,000 pounds, from South Chicago

to all points on the Guernsey branch, a special rate was made of 9.224 cents per hundred pounds to the Missouri River, and 50 per cent of class C rate beyond. On July 3, 1907, on cement in carloads of 60,000 pounds, from South Chicago to Huntley, Mont., and intermediate points, a special rate of 28.38 cents per hundred pounds was made.

The Chicago, Lake Shore and Eastern Railway Company has conceded that on cement in carload lots from South Chicago to points taking Pacific coast terminal rates, Pacific coast terminal divisions may be applied from South Chicago to East Joliet.

On December 10, 1906, the Chicago, Milwaukee and St. Paul Railway Company agreed that on cement in carload lots from South Chicago to Nampa, Boise, and intermediate points the Elgin, Joliet and Eastern switching charge would be absorbed.

On January 7, 1907, the Chicago and Alton Railway Company made a concession similar to that made by the Chicago, Milwaukee and St. Paul Railway Company, as noted in the preceding paragraph.

The Denver and Rio Grande Railroad Company has made the following special rates: On all freight carried in class tariffs from Denver, Colorado Springs, and Pueblo, Colo., Ogden and Salt Lake, Utah, to Delta, Cedar Creek, and Uncompahgre, Colo., and intermediate points, 50 per cent of the class rates will be accepted, effective August 1, 1904. On January 18, 1906, this company agreed that on all freight carried in class tariffs from Ogden and Salt Lake, Utah, Denver, Colorado Springs, Pueblo, and Trinidad, Colo., to Thistle, Utah, and points contiguous, it would accept 50 per cent of class rates in effect January 18, 1906. On August 1, 1904, it named a rate of $1 per ton on coal in carload lots from Grand Junction and Somerset to Uncompahgre Valley points. On November 28, 1906, a rate of 10 cents per hundred was made on lumber in carload lots from Gateview, Madeira Siding, and Spruce, Colo., to Uncompahgre Valley points. On September 14, 1905, a rate of 20 cents per hundred was made on lumber, carloads, from Porter and Glencoe, Colo., to Uncompahgre Valley points. On May 20, 1905, a rate of 11 cents per hundred was made on lumber, carloads, from Sams Spur to Cedar Creek, Colo. On February 20, 1906, a rate of 33 cents per hundred was made on oats, carloads, from Newcastle to Cedar Creek, Colo. On February 1, 1906, a rate of $4 per ton was made on coal, carloads, from Porter to Cedar Creek, Colo. On February 20, 1906, this company made a rate of $3 per car on all commodities, carloads, between East and West Portal Siding. On August 11, 1905, a special rate on all sand and gravel in carloads was made between Cedar Creek, Colona, Delta, and intermediate points, and also from Cimarron, to Uncompahgre Valley points, of 50 per cent of the class rates.

On August 24, 1906, the Great Northern Railway Company made a special rate on lumber and piling, carloads, from Spokane and east to points on the Sun River, Milk River, Lower Yellowstone, Buford-Trenton and Williston projects of 50 per cent of the lumber commodity tariff rate, provided the material is shipped on Government bills of lading. On July 25, 1906, the same company conceded that on machinery and materials moving from St. Paul, Minneapolis, or Minnesota Transfer to Mondak, Mont., the land-grant deduction via the Northern Pacific Railroad from St. Paul, Minneapolis, and Minnesota Transfer to Glendive will apply.

Cement tests at Denver and Chicago Laboratories, July 30, 1904, to June 30, 1907.

[Average of accepted cement.]

Brand.	Number of barrels.	Fineness.		Setting time.		Specific gravity.	Composition of briquets.	Tensile strength.			
								1 day.		7 days.	
		Per cent passing sieve No. 100.	Per cent passing sieve No. 200.	Initial.	Final.			Number of briquets.	Pounds per square inch.	Number of briquets.	Pounds per square inch.
				hrs. m.	*hrs. m.*						
1	5,005	96.6	76.7	3 10	6 30	3.17	Neat.	15	322	260	739
							3 to 1	.....	.....	260	271
2	34,978	94.5	75.6	2 30	6 40	3.11	Neat.	35	391	1,074	698
							3 to 1	.....	.....	1,074	262
3	28,637	92.7	77.6	4 5	8 17	3.16	Neat.	40	354	471	851
							3 to 1	.....	.....	471	324
4	19,711	96.1	74.8	3 57	8 22	3.15	Neat.	35	329	1,195	649
							3 to 1	.....	.....	1,195	302
5	5,500	93.4	78.2	3 25	7 27	3.19	Neat.	20	373	140	867
							3 to 1	.....	.....	140	305
6	143,320	97.1	81.3	3 25	7 35	3.14	Neat.	45	327	2,870	668
							3 to 1	.....	.....	2,870	271
7	5,141	95.2	77.1	3 58	8 52	3.20	Neat.	43	271	243	648
							3 to 1	.....	.....	243	303
Total	242,292	96.0	79.3	3 30	7 06	3.14	Neat.	233	325	6,253	690
							3 to 1	.....	.....	6,253	282

Brand.	Number of barrels.	Tensile strength.									
		28 days.		3 months.		6 months.		1 year.		2 years.	
		Number of briquets.	Pounds per square inch.	Number of briquets.	Pounds per square inch.	Number of briquets.	Pounds per square inch.	Number of briquets.	Pounds per square inch.	Number of briquets.	Pounds per square inch.
1	5,005	260	879	15	911	15	927	5	842	.....	.....
		260	380	15	458	15	493	5	466	.....	.....
2	34,978	1,074	765	40	779	40	777	30	756	15	770
		1,074	354	40	423	40	430	30	466	15	515
3	28,637	471	911	45	852	40	857	20	825	15	824
		471	444	45	465	40	478	20	481	15	482
4	19,711	1,195	717	45	738	45	761	40	790	10	794
		1,195	406	45	477	45	498	40	509	10	482
5	5,500	140	965	20	889	15	870	10	857	.....	.....
		140	446	20	450	15	450	10	380	.....	.....
6	143,320	2,870	805	40	872	35	847	20	868	.....	.....
		2,870	383	40	421	35	427	20	422	.....	.....
7	5,141	243	773	20	770	15	839	5	799	5	812
		243	389	20	450	15	478	5	463	5	441
Total	242,292	6,253	795	225	820	205	823	130	807	45	798
		6,253	388	225	449	205	463	130	468	45	489

In addition to the tests tabulated as above, it may be noted that all of the cement included in this tabulation has passed the hot-water test for soundness, or constancy of volume. Also in the case of long-time tests made on several lots rejected because of failure to pass this test a tendency toward retrogression in tensile strength has been noticed which, while not very serious thus far, shows a tendency in that direction probably sufficient to justify the original rejection of the material on the ground of unsoundness.

With relation to the question of fineness of grinding it is well understood as a general proposition that fine grinding increases the tensile strength of a cement in sand tests, or, in other words, increases

its sand-carrying capacity. It is not always true, however, as between different brands that the one showing the finest grinding will give the highest results on sand tests, for, as will be noticed from the table, the brand showing the finest grinding and one of those showing the coarsest grinding are both among the lowest in tensile strength on the sand tests, while others of those showing the coarser grinding give the highest results in the same tests. It is evident, therefore, that as between different brands other factors may enter to such an extent as to overrule the general proposition above stated. A study of the results obtained from the separate lots tested shows, however, that the above proposition holds good as a general rule with regard to different lots of the same brand.

With regard to the record for setting time there is little necessity for comment, as the setting time has been normal on practically every lot tested. Between the limits of a cement that would be either too quick or too slow setting for convenient use on the work there is latitude for considerable variation in the setting time, and it makes practically no difference in the value of the cement for actual use whether, for instance, the "initial set" is 2 hours or 3 hours, or "final set" 6 hours or 8 hours.

With reference to tensile strength it will be noticed that the results obtained are well above the requirements of the specifications and in general show a satisfactory increase from the earlier periods upward, although in some cases a slight falling off on the long-time tests is shown, this being a characteristic feature of most rotary-kiln cements, especially on the neat tests. It should be noted, also, in studying this table that while the results for the 7-day and 28-day periods are directly comparable as to the number of tests for each period, those for the following periods are not strictly comparable in this respect, although it is believed that the results as given may be taken as being approximately comparable up to the 1-year period at least. As the percentage of increase in tensile strength from the 7-day to the 28-day period is sometimes taken as a criterion of the value of the cement, the following statement is given as showing these percentages for the results given in this table:

Increase in tensile strength of cement from the 7-day to the 28-day period.

Brand.		Tensile strength in pounds per square inch.		Per cent of increase.
		7 days.	28 days.	
1	Neat	739	879	19
	3 to 1	271	380	40
2	Neat	698	765	10
	3 to 1	262	354	35
3	Neat	851	911	7
	3 to 1	324	444	37
4	Neat	649	717	10
	3 to 1	302	406	35
5	Neat	867	965	11
	3 to 1	305	446	46
6	Neat	668	805	21
	3 to 1	271	383	41
7	Neat	648	773	19
	3 to 1	303	389	28
Total	Neat	690	795	15
	3 to 1	282	388	38

It is generally understood that a cement giving low values for the 7-day period will show a larger percentage of increase in 28 days than one giving high 7-day values, and while this is generally true for a given brand, as shown by a study of the separate lots tested from each brand, it will be seen from the above statement that this does not always hold good as between different brands, the remarks made with relation to the tests for fineness applying here also and showing that to a certain extent each brand must be considered by itself. For instance, in the above statement the brand showing the highest 7-day strength on the sand tests shows a higher percentage of increase than that showing the lowest strength, while the latter is next to the lowest in percentage of increase, and the same variation is true, though not to so marked an extent, in the case of the neat tests.

It is generally considered that a cement giving a comparatively low early strength is superior to one giving a high strength at this period, but provided there is no retrogression in the latter at the 28-day period and no serious retrogression at later periods there would seem to be no good reason for such discrimination. Of course, however, a cement giving an extremely high early strength would be subject to suspicion as being likely to show retrogression later unless the general characteristics of the brand were known, and in this connection a knowledge of the general characteristics of the brand in question would be of use in judging of the matter. As far as the brands listed in the above tabulation are concerned, there would seem to be no reason for saying that one showing between 600 and 700 pounds in 7 days is any better than one showing between 800 and 900 pounds for the same period, or vice versa, as both reach approximately the same values on the long-time tests.

FINANCES.

RECEIPTS.

From a review of the receipts from the sale of lands during the fiscal years 1892 to 1900, inclusive, it is estimated that had the reclamation act then been in operation, the following amounts would have been covered into the reclamation fund. The details of this tabulation were given in the fifth annual report, pages 40–41.

Net amounts that would have accrued to reclamation fund from July 1, 1891, to June 30, 1900, had the act been in operation during that period.

1892	$3,185,000.00	1898	$1,505,000.00
1893	3,085,000.00	1899	1,910,000.00
1894	1,760,000.00	1900	2,810,000.00
1895	1,230,000.00		
1896	1,230,000.00	Total	17,800,000.00
1897	1,085,000.00		

The table below shows the amounts covered into the reclamation fund for the years 1901 to 1906, inclusive, as proceeds of the sales of public lands, less allowances for registers and receivers and deductions for the State school funds, as provided in the reclamation act.

Amounts covered into reclamation fund, 1901–1906.

Public lands—	
1901 sales	$3,144,821.91
1902 sales	4,585,520.53
1903 sales	8,713,996.60
1904 sales	6,826,253.59
1905 sales	4,805,515.39
1906 sales	5,166,336.50
Town sites only—	
1907 sales	61,535.00
Total	33,303,979.52

From an estimate made after careful consideration of the actual gross receipts from the sales of public lands during the past fiscal year it is thought the amount to be covered into the reclamation fund as the proceeds of sale of public lands for the fiscal year ending June 30, 1907, will amount to about $7,900,000. The actual figures will probably be known sometime during the month of December, 1907.[a]

In addition to the foregoing there is the special appropriation of $1,000,000, provided by the act of March 3, 1907 (34 Stat. L., 1357), for the Rio Grande dam, which is a partial provision for the Rio Grande project, in pursuance of a convention with Mexico. This appropriation is not reimbursable.

There is another class of receipts arising from the operations of the Service, under the provisions of the act of March 3, 1905 (33 Stat. L., 1032), which provides in effect that all revenues from any of its operations shall be covered into the appropriation. The effect of this method is that such collections operate as a reduction of the expenditures, and they are accordingly reported and discussed under that caption. The receipts herein reported are from the general sales of public lands, and represent the revolving fund, or working capital of the Service.

Under present practice the receipts from the sales of public lands during an entire fiscal year are carried by appropriation warrant into the reclamation fund about six months after the close of the fiscal year. It is therefore eighteen months after the first payments are made into the local land offices and six months after the last payments are made before the funds so received become available for reclamation purposes. Consideration is now being given to the possibility of having the public land accounts stated and settled quarterly instead of annually, and the cooperation of the General Land Office and the Treasury Department is being asked. Should it be possible to make such an arrangement, and to somewhat hasten the settlements, the receipts from sales of lands would, on an average, become available about six months earlier than at present.

Following is a table showing by States the total receipts from the sale of public lands during the fiscal years 1901 to 1906, inclusive, and from town-site lots during the fiscal year 1907.

[a] The receipts for the fiscal year 1907 are given in the appendix, p. 277.

Proceeds of sales of public lands, 1901–1906.

State.	Amount.	Restricted.	Unrestricted.
Arizona	$298,327.25	$152,146.90	$146,180.35
California	2,562,377.70	1,306,812.63	1,255,565.07
Colorado	2,503,802.05	1,276,939.04	1,226,863.01
Idaho	2,411,410.08	1,229,819.14	1,181,590.94
Kansas	215,245.19	109,775.05	105,470.14
Montana	2,633,324.55	1,342,995.52	1,290,329.03
Nebraska	746,553.81	380,742.44	365,811.37
Nevada	100,772.25	51,393.85	49,378.40
New Mexico	723,365.27	368,916.29	354,448.98
North Dakota	5,373,604.90	2,740,538.50	2,633,066.40
Oklahoma	3,642,029.10	1,857,434.84	1,784,594.26
Oregon	5,260,449.82	2,682,829.41	2,577,620.41
South Dakota	1,302,472.68	664,261.06	638,211.62
Utah	476,671.41	243,102.42	233,568.99
Washington	3,541,391.57	1,806,109.70	1,735,281.87
Wyoming	1,512,181.89	771,212.76	740,969.13
Total	33,303,979.52	16,985,029.55	16,318,949.97

PROJECT AUTHORIZATIONS.

In the fifth annual report there was given a chronological list of authorizations and allotments for those projects that had been approved for construction. As hereinafter explained, there has been adopted a policy of providing annual allotments, and project authorizations will not in future attempt to provide the necessary allotments for construction, but the latter matter will be taken up from time to time as the necessary funds are in hand and available for use. The following is a chronological list of project authorizations made during the last fiscal year. Previous authorizations are given on pages 43 and 44 of the fifth annual report:

39. December 18, 1906, approving conditionally the Orland project, California, and making allotment.
40. April 6, 1907:
    Approving additional allotment to Uncompahgre project, Colorado.
    Approving additional allotment to Minidoka project, Idaho.
    Approving additional allotment to Hondo project, New Mexico.
41. April 6, 1907:
    Approving allotment to secondary projects, all States, to cover past expenditures and requirements for the current calendar year.
    Approving allotment to town-site operations, all States, to cover past expenditures and requirements for the present calendar year.

ALLOTMENTS.

The amounts heretofore allotted for the various projects and listed on pages 43 to 45 of the fifth annual report, were based upon estimates of the probable cost of the entire project or of those portions then undertaken. Such amounts were not based upon the funds then available for disbursement, but rather upon the funds which it was estimated would be in hand by the time the work of construction had progressed to the point where the expenditure of such amounts was required. The rapid progress of the work during the past two years had made it necessary to consider the plans for future work, with careful reference to the availability of the funds necessary to carry out such plans.

In doing this it has been found desirable to provide annual allotments, and to make these available by calendar years instead of by fiscal years. This practice is desirable from the practical viewpoint of the constructing engineer, who must make his plans with a view to carrying them out during the seasons when outdoor work is possible, but it also happens that it is the easier method, because the annual additions to to the reclamation fund usually become available about the first of the calendar year.

It has also been necessary to consider allotments with a view to conforming to the provisions of section 9 of the reclamation act, which provides that, subject to practicability and feasibility, the major portion of the funds arising in any one State shall be expended for the benefit of that State; and that if temporarily diverted for use elsewhere, the excess shall, subject to the same conditions, ultimately and within each ten years' period, be restored to the fund for the use and benefit of the States from which they arose. But while this question must be considered in its relation to the allotments proposed, the data for it is derived principally from a study of the general receipts and disbursements, and it is accordingly treated herein after those subjects.

At a conference of the chief and supervising engineers, who met with the Secretary of the Interior and director at Fallon, Nev., during the last week of July, 1907, consideration was given to the estimates of the field engineers and a fiscal programme was recommended. This programme, which was approved by the Secretary on July 27, 1907, provided definite allotments for the calendar year 1907, and tentative allotments for the year 1908. These allotments are shown in the following table:

Project allotments, 1906, 1907, 1908.[a]

States chargeable and proportions.	Project.	Allotment to Dec. 31, 1906.	Allotment, 1907.	Tentative allotment, 1908.
Arizona	Salt River	$3,059,412.22	$1,390,000	$850,000
California	Orland	8,776.19	6,000	150,000
	Colorado River	0.00	000	000
California-Arizona [b]	Yuma	805,981.00	948,000	600,000
Colorado	Uncompahgre	1,907,790.37	972,000	460,000
Idaho	Minidoka	1,397,115.60	432,000	60,000
	Payette-Boise	565,825.76	894,000	450,000
Kansas	Garden City	33,797.86	226,000	10,000
Montana	St. Mary	139,510.64	139,000	.....
	Huntley	351,381.07	433,000	20,000
	Sun River	79,796.68	279,000	100,000
Nebraska-Wyoming [c]	North Platte	1,543,726.20	1,808,000	450,000
Nevada	Truckee-Carson	3,345,855.32	476,000	140,000
New Mexico	Hondo	348,708.18	9,000	10,000
	Carlsbad	372,843.77	199,000	20,000
	Leasburg	11,603.74	185,000	10,000
New Mexico-Texas [d]	Rio Grande	48,404.15	1,000	2,000
North Dakota	Williston	65,505.74	309,000	20,000
	Buford-Trenton	14,018.24	288,000	20,000
	Nesson	22,796.48	5,000	5,000
North Dakota-Montana [e]	Lower Yellowstone	550,478.90	1,347,000	450,000
Oklahoma	Cimarron	508.26	6,000	5,000
Oregon-California [f]	Klamath	710,384.11	670,000	350,000

[a] A revised table of allotments, based on the actual proceeds of sales of public land during the fiscal year 1907, is given in the Appendix, p. 278.

[b] California 17 per cent, Arizona 83 per cent.

[c] Nebraska 70 per cent, Wyoming 30 per cent.

[d] New Mexico 60 per cent, Texas 40 per cent.

[e] North Dakota 33 per cent, Montana 67 per cent.

[f] Oregon 75 per cent, California 25 per cent.

Project allotments, 1906, 1907, 1908—Continued.

States chargeable and proportions.	Project.	Allotment to Dec. 31, 1906.	Allotment, 1907.	Tentative allotment, 1908.
Oregon	Umatilla	$128,117.13	$578,000	$249,000
South Dakota	Belle Fourche	561,925.21	810,000	450,000
Utah	Strawberry	119,139.89	300,000	190,000
Washington	Okanogan	90,420.80	282,000	70,000
	Tieton	51,384.06	534,000	804,000
	Sunnyside	276,114.01	207,000	287,000
	Yakima Storage[a]	55,211.16	.....	.....
	Wapato	4,038.10	4,000	40,000
Wyoming	Shoshone	715,954.34	1,418,000	500,000
All States	Secondary projects	682,942.99	26,000	18,000
	Town-site operations	5,270.08	7,000	10,000
	Washington inventory	27,089.22	12,000	.....
	Total	18,101,827.47	15,200,000	6,800,000

[a] To be apportioned to Tieton and Sunnyside and any other projects in the Yakima district upon the basis of benefits.

DISBURSEMENTS AND COLLECTIONS.

The cost of the projects consists of the net disbursements therefor and the unpaid liabilities outstanding. In all the bookkeeping of the Service the amounts of the paid and of the collected vouchers are used as a control upon the accuracy of the other figures. These amounts are in turn controlled by the reports of the Treasury Department, showing the additions to and the withdrawals from the fund as a whole. The following tables are similar to those appearing in the last annual report and represent the condensed results of the general bookkeeping through which the accuracy of the project office records is determined.

TABLE 1.—*Controlling statement of the accounts of the reclamation fund (32 Stat. L., 388) to June 30, 1907.*

		Dr.	Cr.
Capital account, reclamation fund. Appropriation warrants as follows:			
No. 5, Oct. 15, 1902, for fiscal year 1901	$3,144,821.91		
No. 16, June 3, 1903, for fiscal year 1902	4,585,520.53		
No. 13, Feb. 1, 1904, for fiscal year 1903	8,713,996.60		
No. 6, Jan. 5, 1905, for fiscal year 1904	6,826,253.59		
No. 10, Jan. 22, 1906, for fiscal year 1905	4,805,515.39		
No. 11, Jan. 3, 1907, for fiscal year 1906	5,166,336.50		
No. 12, Jan. 25, 1907, for fiscal year 1907	60,160.00		
No. 21, Apr. 25, 1907, for fiscal year 1907	250.00		
No. 29, June 29, 1907, for fiscal year 1907	1,125.00		
Total		.....	$33,303,979.52
Gross disbursements as per Table 2	25,248,641.18		
Gross collections as per Table 3	239,762.89		
Net disbursements as per Tables 4 and 5 below	25,008,878.29		
Net disbursements reclamation projects as per Table 4		$25,003,449.64	
Net disbursements town sites as per Table 5		5,428.65	
Balances with special fiscal agents as per Table 6		805,490.56	
Balance with Treasurer United States as per Table 7		7,489,610.67	
		33,303,979.52	33,303,979.52

New Mexico-Texas: Rio Grande project	$48,730.40
North Dakota:	
Williston project	127,198.23
Buford-Trenton project	38,655.18
Nesson project	15,510.94
North Dakota-Montana: Lower Yellowstone project	808,347.77
Oklahoma: Cimarron project	2,247.00
Oregon: Umatilla project	496,993.44
Oregon-California: Klamath project	1,061,773.07
South Dakota: Belle Fourche project	820,966.83
Utah: Strawberry Valley project	233,811.29
Washington:	
Okanogan project	185,656.23
Yakima-Tieton project	177,018.49
Yakima-Sunnyside project	307,704.47
Yakima-Wapato project	4,154.66
Yakima-Storage and general, undistributed	132,086.73
Wyoming: Shoshone	1,439,214.38
Washington office inventory, undistributed	30,672.44
Total	24,313,658.33

SECONDARY PROJECTS UNDER CONSIDERATION.

Arizona:	
San Carlos project	$23,664.71
San Pedro project	2,423.37
Little Colorado project	7,994.03
California:	
Sacramento Valley project	34,557.50
Owens Valley project	26,061.92
San Joaquin project	3,531.20
California-Arizona: Colorado River project	18,082.39
Colorado:	
Grand Valley project	8,712.20
White River project	4,325.27
Idaho: Dubois project	15,846.44
Montana:	
Lower Milk River project	87,094.92
Marias project	13,876.76
Crow Reservation project	21,032.58
Madison River project	10,568.30
Lake Basin project	7,101.76
Clark Fork project	5,851.13
Nebraska: South Platte underflow project	2,877.01
Nevada: Walker River project	12,220.29
New Mexico:	
Urton Lake project	17,408.23
Las Vegas project	4,760.13
La Plata project	27,968,17
North Dakota:	
Bismarck project	14,196.61
Little Missouri project	5,889.65
Oklahoma: Red River project	57,745.00
Oregon:	
Malheur project	70,987.21
Central Oregon project	22,690.61
Utah:	
Utah Lake project	34,040.05
Bear Lake project	18,761.28
Washington:	
Yakima-Benton project	11,167.45
Yakima-Kittitas project	6,741.91
Palouse project	76,144.14
Priest Rapids project	6,452.81
Wyoming: De Smet project	9,016.28
Total	689,791.35

SUMMARY.

Total primary projects	$24,313,658.33
Total secondary projects	689,791.31
Total	25,003,449.64

TABLE 5.—*Net expenditures on town sites to June 30, 1907 (under acts approved April 16, 1906, and June 27, 1907).*

Idaho: Minidoka district town sites—Heyburn, Rupert, and Scherer	$5,428.65

TABLE 6.—*Balances in the hands of fiscal officers June 30, 1907.*

John D. McChesney, chief disbursing clerk, U. S. Geological Survey		$7,075.95
Special fiscal agents, U. S. Reclamation Service:		
William S. Arthur		12,274.30
Charles B. Barnhard		39,859.67
Harry N. Bickel		59,307.58
Fred W. Brose		34,980.81
George W. Brydges		17,483.33
Hugh T. Caldwell		21,601.12
Fred L. Cavis		13,676.64
Charles W. Donally		39,216.08
George M. Eba		15,621.79
Harry E. Essley		55,944.63
Joseph C. Gawler—		
Debit as special fiscal agent	$34,257.43	
Credit as special disbursing agent	1.09	
		34,256.34
Anton H. Gullickson		109.92
Esco Hamilton		33,639.84
Christopher C. Hogue		35,710.14
Francis J. Israel		40,204.17
Thomas E. Jones		8,369.98
Frank W. Kirksey		59,449.20
Clarence A. Lindeman		11,197.07
George G. Mair		50,000.00
George E. Moore		42,154.43
Edwin D. Newman		18,352.92
Swan T. Olsen		46,750.20
Clarence M. Paddock		26,687.98
Henry P. Seidemann		3,421.60
Aldus H. Shellenberger		9,093.62
James W. Spencer		47,285.75
Herbert A. Yates		21,765.50
		805,490.56

TABLE 7.—*Verification of appropriations, withdrawals, and balances from published statements of the Treasury Department.*

Title of publication.		Appropriations.	Withdrawals.	Balances.
Statement of balances, appropriations, and expenditures of the Government for the fiscal year ended—				
June 30, 1903, page 52		$7,730,342.44	$268,517.23	$7,461,825.21
June 30, 1904, page 42		8,713,996.60	1,611,650.19	14,564,171.62
June 30, 1905, page 42		6,826,253.59	3,882,020.53	17,508,404.68
June 30, 1906, page 38		[a] 4,805,608.04	[a] 7,256,926.75	15,057,085.97
Appropriation warrants, 1907:				
No. 11, Jan. 3, 1907	$5,166,336.50			
No. 12, Jan. 25, 1907	60,160.00			
No. 21, Apr. 25, 1907	250.00			
No. 29, June 29, 1907	1,125.00			
		5,227,871.50		
Combined statement of the receipts and disbursements for the fiscal year ended June 30, 1907, page 56			12,795,346.80	
Total		33,304,072.17	25,814,461.50	
Balance June 30, 1907				7,489,610.67

[a] This amount includes $92.65 carried to the fund by appropriation warrant No. 20, dated June 2, 1906, which was issued for the amount of a deposit erroneously covered into miscellaneous receipts. This amount is treated in the Reclamation Service accounts *as a repayment, thereby* reducing both appropriations and withdrawals by this amount.

DETAILED ANALYSIS OF DISBURSEMENTS AND COLLECTIONS.

In the body of this report there appears under each project heading a tabular statement showing a distribution of the net expenditures on such project according to the purpose and character of the expense. For the primary projects under construction there is also given an analysis of the same net cost according to the physical features of the projects. These statements are compiled from field bookkeeping records, but are in agreement with the preceding statements which are from the controlling accounts kept in the Washington office.

A study of the statistics already given herein presents the following interesting facts as to the rate at which funds have been disbursed and collected.

The gross disbursements during the fiscal year 1907 were $12,391,214.18. During the four years preceding the gross disbursements were $12,857,427, or only a little over $500,000 more than during the last fiscal year. During the last six months of the calendar year 1902 the gross disbursements were $100,394.02. During the calendar year 1903 the disbursements reached $659,337.30, or slightly less than $55,000 per month. The earlier construction work was undertaken during 1904, when the disbursements increased to $2,722,782.62, or about $227,000 per month. During 1905 the disbursements reached $5,245,091.48, or $437,000 per month. During 1906 the disbursements were $9,497,667.07 or nearly $791,000 per month. During the first six months of 1907 the disbursements were $7,023,368.69, or $1,170,000 per month. Since February there has been a gradual decrease in the amounts of the monthly disbursements, and it is probable that the average monthly outgo during the present calendar year will be less than $1,100,000.

The gross amount received from miscellaneous collections to June 30, 1907, is $239,762.89, as shown by Table 3. Prior to the present calendar year all claims or vouchers which were approved and sent to the Auditor for direct settlement and the issuance of Treasury warrants to claimants were recorded as paid and charged to the respective project accounts. If such claims were subsequently withdrawn before settlement, the amounts were credited to the projects and charged to the Treasury as repayments, the same as deposits. The amount of claims so withdrawn was $71,147.46, making the amount of the actual cash collections to June 30, 1907, $168,615.43. These collections are made under the act of March 3, 1905 (33 Stat. L., 1032), which provides that all receipts from various incidental operations of the Service shall be covered into the appropriation as repayments. Up to the end of the calendar year 1905 such cash collections were slightly over $14,000; during 1906 they reached about $38,000, and during six months of 1907 they have increased to over $116,000. In the future the amount of these miscellaneous revenues will be largely increased. In addition to the cash collections arising from the incidental operations of the Service, as mess houses, mercantile stores, rentals of buildings and lands, telephone and other public services, and from refunds upon contractors' railroad freights, there will in the future be large collections from contracts for furnishing power and for temporarily supplying water from partly

finished irrigation works, and from the repayments by applicants for water rights of the costs of construction and of operation and maintenance.

The following table shows the amount of such collections to June 30, 1907, the projects upon which they were made, and the sources from which they were derived. It is a continuation of the data given in Tables 3 and 4, on page 47, of the fifth annual report:

Sources of the cash collections reported in Table 3, page 30.

Period and projects.	Disbursement vouchers withdrawn.	Sales at mess houses, mercantile stores, etc.	Rentals of lands, buildings, power and other buildings.	Freight refunds.	Miscellaneous.	Total.
July 1, 1902, to June 30, 1906:						
All projects	$57,258.65	$5,621.95	.....	$7,273.80	[a] $9,000.00	$79,154.40
Fiscal year 1907:						
Salt River	.....	2,806.46	$1,757.40	25.00	[b] 12,000	16,588.86
Yuma	2,337.05	1,339.09	.....	741.94	.....	4,418.08
Uncompahgre	.....	28,325.04	.....	1,255.29	.....	29,580.33
Minidoka	.....	97.17	.....	3,283.24	.....	3,380.41
Payette-Boise	.....	219.50	.....	3,317.21	.....	3,536.71
Garden City	.....	30.37	.....	1.48	.....	31.85
St. Mary	.....	272.88	19.20	.....	.....	292.08
Huntley	.....	2,308.19	102.30	.....	.....	2,410.49
Sun River	.....	870.61	.....	.....	.....	870.61
North Platte	.....	1,254.14	.....	4,627.52	.....	5,881.66
Truckee-Carson	.....	339.67	93.60	49.63	[a] 3,936.61	4,419.51
Hondo	.....	51.45	.....	564.66	.....	616.11
Carlsbad	.....	833.23	240.00	.....	[b] 234.11	1,307.34
Leasburg	.....	546.95	.....	.....	.....	546.95
Rio Grande	.....	.32	.....	.....	.....	.32
Lower Yellowstone	2,527.38	221.40	927.55	1,391.32	.....	5,067.65
Williston	.....	28.73	.....	.....	.....	28.73
Buford-Trenton	.....	25.13	.....	.....	.....	25.13
Nesson	.....	.10	.....	.....	.....	.10
Umatilla	.....	167.91	.....	142.03	.....	309.94
Klamath	.....	99.67	.....	.....	.....	99.67
Belle Fourche	9,024.38	370.28	1.00	.....	.....	9,395.66
Strawberry	.....	796.32	.....	15.94	.....	812.26
Okanogan	.....	1.90	.....	2.52	.....	4.42
Tieton	.....	198.58	.....	.....	.....	198.58
Sunnyside	.....	1.25	.....	.....	[b] 43,920.80	43,922.05
Yakima Storage	.....	375.22	.....	.....	.....	375.22
Shoshone	.....	15,925.01	15.00	8,491.74	.....	24,431.75
Washington Office	.....	575.63	.....	3.50	.....	579.13
Sacramento Valley	.....	23.50	.....	.....	.....	23.50
Owens Valley	.....	14.00	.....	.....	.....	14.00
San Joaquin	.....	.45	.....	.....	.....	.45
Colorado River Storage	.....	551.83	.....	.....	.....	551.83
Lower Milk River	.....	90.85	.....	.....	.....	90.85
La Plata	.....	.25	.....	.....	.....	.25
Bismarck	.....	12.06	.....	.....	.....	12.06
Red River	.....	139.05	.....	.....	.....	139.05
Malheur	.....	221.95	.....	.....	.....	221.95
Central Oregon	.....	422.95	.....	.....	.....	422.95
Total fiscal year 1907.	13,888.81	59,559.09	3,156.05	23,913.02	60,091.52	160,608.49
Total 1903–1907	71,147.46	65,181.04	3,156.05	31,186.82	69,091.52	239,762.89

[a] Forfeitures by defaulting bidders and contractors.
[b] Temporary water rentals.

LIABILITIES.

In addition to the transactions which have been completed by payment through checks of fiscal officers, or warrants drawn upon direct settlement in the Treasury, there are in the aggregate quite a large number of accounts upon which payment is necessarily deferred. Most contracts provide for monthly settlements, many dealers sub-

mit monthly accounts, and pay rolls for services performed are prepared by the calendar month. It is of course impossible to effect payment of these expenses during the month when the expense was incurred. Payment of other accounts is delayed through the failure of claimants to submit them promptly, so that in the aggregate such liabilities amount to a considerable sum.

Among such deferred liabilities are the "holdbacks," or retained percentages on contracts which expressly provide for deferred payments; railroad freight and passenger charges, the bills for which require considerable time for preparation in the railroad auditors' offices and for examination by the Service; accounts of contractors, merchants, and employees which are in process of settlement, and numerous small items which are not submitted promptly or which are unclaimed for a long time. In addition there is a contingent liability upon each contract which has not been fully performed, but in the fiscal records only those items are considered as accrued liabilities that have been fully earned and the results of which have gone into the work accomplished.

The following table shows the amount of these liabilities as far as determined on June 30, 1907:

Outstanding liabilities on June 30, 1907.

Project.	Approved claims in process of settlement.	Contract holdbacks earned and unpaid.	Contingent contract liabilities.
Salt River	$12,706.52	$11,193.19	$1,261,146.43
Orland	296.81	.....	.....
Yuma	35,081.22	.....	50,615.25
Uncompahgre	44,129.15	22,760.74	254,156.59
Minidoka	.....	.....	108,597.47
Payette-Boise	38,705.55	37,846.06	302,829.96
Garden City	12,984.95	11,900.00	40,563.00
St. Mary	16,538.16	.....	.....
Huntley	24,749.11	40,777.59	138,028.50
Sun River	13,632.25	12,890.51	148,440.00
North Platte	24,612.83	20,134.23	891,848.49
Truckee-Carson	1,200.84	.....	10,244.99
Hondo	6.50	.....	.....
Leasburg	13,340.13	13,340.13	84,353.13
Williston	8,670.95	8,286.22	176,985.83
Buford-Trenton	5,194.24	5,193.34	81,481.98
Lower Yellowstone	101,504.81	101,504.82	121,239.66
Umatilla	18,158.75	16,641.30	17,709.90
Klamath	2,346.84	2,178.30	84,221.27
Belle Fourche	38,299.79	38,278.49	982,008.04
Strawberry	3,033.77	.....	46,713.00
Okanogan	5.00	.....	2,284.25
Tieton	17,423.88	10,974.37	316,725.79
Shoshone	50,803.21	44,131.36	983,751.95
General administration	2,452.06	.....	.....
Total	485,877.62	398,030.65	7,253,945.48

RECAPITULATION.

Approved claims in process of settlement	$485,877.62
Holdbacks earned and unpaid	398,030.65
Railroad freight	303,264.49
Railroad passenger transportation	5,115.00
Unpaid labor, estimated	279,861.44
Grand total	1,472,149.20

ESTIMATES OF FUTURE EXPENDITURES.

The methods for authorizing and incurring expenses against the reclamation fund were described in detail in the last annual report. As therein stated it is practically impossible to foresee future requirements sufficiently to enable the supervising engineers to make annual estimates. They accordingly submit their plans for future work and estimates of the funds required therefor by quarters. These are made up on the 15th of the months of February, May, August, and November, and cover the work proposed for the next following quarters. After review they are submitted to the Secretary of the Interior for approval and authorization.

These estimates are made with a view to their being sufficient to provide for all expenses of the work to be carried on during the ensuing quarter and also to meet all demands for payment of liabilities incurred on account of prior work. As a matter of fact the disbursements during any given quarter rarely equal the approved estimates therefor, as payment for some portion of the expense covered by the estimates is always delayed until after the expiration of the period covered by the estimate. Even when the progress of work has been accurately forecasted there are certain classes of expense on which delays in payment are unavoidable. The classes and amounts of these deferred payments have already been discussed herein under the heading "Liabilities."

From the quarterly estimates the following table has been prepared showing the estimates of the probable amounts required during the period of eighteen months from July 1, 1907, to December 31, 1908:

Estimated expenditures July 1, 1907, to December 31, 1908.

Twenty-first quarter, July 1 to September 30, 1907	$3,472,141.00
Twenty-second quarter, October 1 to December 31, 1907	3,761,943.00
Twenty-third quarter, January 1 to March 31, 1908	2,700,000.00
Twenty-fourth quarter, April 1 to June 30, 1908	2,700,000.00
Twenty-fifth quarter, July 1 to September 30, 1908	2,100,000.00
Twenty-sixth quarter, October 1 to December 31, 1908	2,040,179.34
Total	15,774,263.34

EQUALIZATION OF EXPENDITURES BETWEEN STATES WITHIN TEN-YEAR PERIODS.

Section 9 of the reclamation act is as follows:

Sec. 9. That it is hereby declared to be the duty of the Secretary of the Interior in carrying out the provisions of this act, so far as the same may be practicable and subject to the existence of feasible irrigation projects, to expend the major portion of the fund arising from the sale of public lands within each State and Territory hereinbefore named for the benefit of arid and semiarid lands within the limits of such State or Territory: *Provided*, That the Secretary may temporarily use such portion of such fund for the benefit of arid or semiarid lands in any particular State or Territory hereinbefore named as he may deem advisable, but when so used the excess shall be restored to the fund as soon as practicable, to the end that ultimately and in any event, within each ten-year period after the passage of this act, the expenditures for the benefit of the said States and Territories shall be equalized according to the proportions and subject of the conditions as to practicability and feasibility aforesaid.

In view of the above the following principles have been announced:

The first controlling factor in such equalization is time, which the section quoted says shall be "within each ten-year period after the passage of this act." The act was passed June 17, 1902. The Service was organized July 9, 1902. The accounts are kept by quarters and fiscal years ending on June 30 each. The first ten-year period will therefore be taken to end on June 30, 1912.

The second controlling factor in such equalization is the relation of the major portions of the receipts from the several States, subject to conditions of practicability and feasibility. The receipts of each fiscal year become available about the first of the following calendar year. The available funds June 30, 1912, will therefore have included the receipts for the fiscal years 1901 to 1911, inclusive, and at that time the expenditures within each State should at least equal 51 per cent of the receipts from that State for 1901 to 1911, inclusive, subject to conditions of practicability and feasibility, as set out in the section.

APPORTIONMENT OF EXPENDITURES BETWEEN STATES ON INTERSTATE PROJECTS.

The basis for charges to two or more States for the cost of interstate projects shall be in proportion to the quantity of lands benefited or to be benefited, with the cost of such work lying respectively within the boundaries of such States, multiplied by the charge per acre as fixed by the Secretary of the Interior.

PRINCIPLES GOVERNING THE ENTRIES FOR ALL DISBURSEMENTS AND COLLECTIONS.

The reclamation act provides for the ultimate return to the Government of the moneys expended therefrom. While in practice there may prove to be difficulties in so assessing the charges upon the lands benefited as to exactly provide for expenses not yet finally determined when the charges are assessed, yet with a view to accomplishing this result as nearly as possible, certain governing principles have been considered and announced. These rules are as follows:

1. All expenditures will be charged to (*a*) primary projects under construction; (*b*) secondary projects under consideration; (*c*) general expense accounts and periodically distributed to primary projects; (*d*) town-site expense accounts.

2. The expense on abandoned projects shall be charged to all primary projects in proportion to the difference between the value of the reclaimed land and the charge for the water right, and in sufficient amounts to absorb all such expense within the ten-year periods.

3. Each year all secondary projects shall be classified into two classes; first, those on which future construction is probable to an extent sufficient to provide for one-half or more of the expense theretofore incurred, and, second, those on which construction has been abandoned or on which future construction is not probable to an extent sufficient to provide for one-half of the expense theretofore incurred. The expense on the projects in the second class shall be charged as set out under 2 above.

4. All collections from sales of lands and sales of town-site lots shall be credited to the capital or appropriation account of the State from which they arise.

5. All collections for water-right charges, for cost of construction, or cost of operation and maintenance made, whether through the General Land Office or otherwise, and from leases, sales of power, and miscellaneous sources made by the Service direct, shall be credited to the projects from which they arise.

Under these rules the expenses on projects considered and abandoned because of their nonfeasibility, will from time to time be distributed in such way as to contemplate the return to the appropriation of all expenditures therefrom. At the same time, provision will be made for the equalization of expenditures within States in accordance with section 9.

The following table gives a comparison of the actual disbursements (upon primary projects under construction) by States with the present restricted funds—that is, the major portion or 51 per cent of the amounts thus far received from the several States. Expenditures on secondary projects to the amount of $629,978.75 are not included in the expenditures by States.

Amounts expended in the various reclamation States and Territories to June 30, 1907, and the restricted funds.

State and project.	Expenditures by projects.	Expenditures by States.	Restricted funds by States.
Arizona		$5,218,326.36	$152,146.90
Salt River	$3,906,889.52		
Yuma, 83 per cent of $1,580,044.38	1,311,436.84		
California		564,206.39	1,306,812.63
Yuma, 17 per cent of $1,580,044.38	268,607.54		
Klamath, 25 per cent of $1,061,773.07	265,443.27		
Orland	12,073.19		
Colorado River	18,082.39		
Colorado		2,384,047.53	1,276,939.04
Uncompahgre	2,384,047.53		
Idaho		2,652,132.81	1,229,819.14
Minidoka	1,644,114.45		
Payette-Boise	1,008,018.36		
Kansas		164,278.00	109,775.05
Garden City	164,278.00		
Montana		1,474,393.77	1,342,995.52
St. Mary	184,080.28		
Huntley	609,233.31		
Sun River	139,487.17		
Lower Yellowstone, 67 per cent of $808,347.77	541,593.01		
Nebraska		1,506,925.99	308,742.44
North Platte, 70 per cent of $2,152,751.42	1,506,925.99		
Nevada		3,646,508.42	51,393.85
Truckee-Carson	3,646,508.42		
New Mexico		980,628.99	368,916.29
Hondo	356,363.88		
Carlsbad	505,269.58		
Leasburg	89,757.29		
Rio Grande, 60 per cent of $48,730.40	29,238.24		
North Dakota		468,205.37	2,740,538.50
Lower Yellowstone, 33 per cent of $808,347.77	266,754.76		
Williston	127,198.23		
Buford-Trenton	38,655.18		
Nesson	15,510.94		
Bismarck (secondary)	14,196.61		
Little Missouri (secondary)	5,889.65		
Oklahoma		59,992.00	1,857,434.84
Cimarron	2,247.00		
Red River (secondary)	57,745.00		
Oregon		1,293,323.24	2,682,829.41
Klamath, 75 per cent of $1,061,773.07	796,329.80		
Umatilla	496,993.44		
South Dakota		820,966.83	664,261.06
Belle Fourche	820,966.83		
Texas		19,492.16	
Rio Grande, 40 per cent of $48,730.40	19,492.16		
Utah		233,811.29	243,102.42
Strawberry	233,811.29		

Amounts expended in the various reclamation States and Territories, etc.—Continued.

State and project.	Expenditures by projects.	Expenditures by States.	Restricted funds by States.
Washington		$806,620.58	$1,806,109.70
Okanogan	$185,656.23		
Tieton	177,018.49		
Sunnyside	307,704.47		
Yakima Storage, etc	132,086.73		
Wapato	4,154.66		
Wyoming		2,085,039.81	771,212.76
Shoshone	1,439,214.38		
North Platte, 30 per cent of $2,152,751.42	645,825.43		
Total	24,378,899.54	24,378,899.54	
Secondary projects and miscellaneous not included above		629,978.75	
Grand total		25,008,878.29	

Estimates of the future additions to the fund were placed at $6,800,000 for sales of lands in 1907, and $6,000,000 for each year 1908, 1909, and 1910. If these estimates are realized, and if the proportions arising from each State are in the same ratio as during the years 1901 to 1906, the additions to the fund by States and the total amount from each State will be as shown in the following table:

Receipts by States, 1901 to 1910.

States.	Percentage of all receipts, 1901–1906.	Receipts, 1901–1906.	Estimated receipts, 1907–1910.	Total estimated receipts, 1901–1910.
Arizona	0.90	$298,327.25	$223,200	$521,527.25
California	7.78	2,562,377.70	1,929,440	4,491,817.70
Colorado	7.52	2,503,802.05	1,864,960	4,368,762.05
Idaho	7.05	2,410,285.08	1,748,400	4,158,685.08
Kansas	0.65	215,245.19	161,200	376,445.19
Montana	7.92	2,633,324.55	1,964,160	4,597,484.55
Nebraska	2.24	746,553.81	555,520	1,302,073.81
Nevada	0.30	100,772.25	74,400	175,172.25
New Mexico	2.17	723,365.27	538,160	1,261,525.27
North Dakota	16.15	5,373,604.90	4,005,200	9,378,804.90
Oklahoma	10.95	3,642,029.10	2,715,600	6,357,629.10
Oregon	15.85	5,260,449.82	3,930,800	9,191,249.82
South Dakota	3.92	1,302,472.68	972,160	2,274,632.68
Texas	0.00	0.00	0.00	0.00
Utah	1.40	476,671.41	347,200	823,871.41
Washington	10.65	3,541,391.57	2,641,200	6,182,591.57
Wyoming	4.55	1,512,181.89	1,128,400	2,640,581.89
Total	100.00	33,302,854.52	24,800,000	58,102,854.52
Restricted portion, 51 per cent				29,632,455.81
Unrestricted portion, 49 per cent				28,470,398.71

Certain tentative plans have been outlined for the remote future, and incomplete estimates of the probable cost of the work have been made. These plans look to the restoration to certain States of the excess of funds temporarily used elsewhere under the authority of the act. The following table shows the estimated gross receipts, restricted funds, and proposed expenditures on December 31, 1911.

Comparison of estimated total receipts, restricted funds, and proposed expenditures, by States, to December 31, 1911.

States.	Total receipts.	Restricted funds, 51 per cent.	Proposed expenditures.[a]
Arizona	$521,527	$265,979	$10,097,800
California	4,491,818	2,290,827	2,585,200
Colorado	4,368,762	2,228,069	4,140,000
Idaho	4,158,685	2,120,929	3,949,000
Kansas	376,445	191,987	270,000
Montana	4,597,485	2,344,717	4,064,500
Nebraska	1,302,074	664,057	2,661,400
Nevada	175,172	89,338	3,962,000
New Mexico	1,261,525	643,378	2,698,800
North Dakota	9,378,805	4,783,191	3,145,500
Oklahoma	6,357,629	3,242,391	732,000
Oregon	9,191,250	4,687,537	5,154,000
South Dakota	2,274,633	1,160,063	2,222,000
Texas	0	0	1,021,200
Utah	823,871	420,174	1,409,000
Washington	6,182,592	3,153,122	4,360,000
Wyoming	2,640,582	1,346,697	4,774,600
Unrestricted funds	.....	28,470,399	.....
Secondary projects [a]	.....	.....	855,000
Total	58,102,855	58,102,855	58,102,000

[a] Secondary projects are not included in proposed expenditures, by States, except in North Dakota and Oklahoma.

COOPERATION.

On most of the large projects the reservoirs and main trunk canals are completed, and the heaviest expenses are already incurred. In order to make these investments fully productive it is necessary to build many smaller works and to bring about a considerable extension of the distribution system. In some cases settlers are already on the lands clamoring for water, and express a willingness to cooperate with the Reclamation Service by doing a large portion of the excavation, taking credit therefor on their water-right payments, if the United States will build certain necessary structures and furnish engineering supervision. Such cooperation it is believed should be encouraged.

Accordingly in projects where extensions are planned or are demanded by settlers already on the ground, this idea of self-help will be stimulated by announcing that all payments for water rights on that project will be devoted to its extension. At present the only projects to which this principle has been applied are the North Platte in Nebraska, and the Minidoka project in Idaho.

ACCOUNTING.

In the last annual report reference was made to the efforts which were being made to devise and install a system of accounting which while adequately safeguarding and recording the use of public funds and providing necessary information as to the cost of work, would also be simple and effective in its operation. Much of the adopted system had been in previous use upon some of the projects, but early in 1907 a uniform system was adopted and installed generally. By this scheme of accounts the details are kept only at the field offices and one paper record is often made to serve several pur-

poses, or if more than one is necessary the additional copies are produced by manifold processes. The cost data developed by this system are immediately available for use in the field, while its accuracy in totals is controlled through accounts in the Washington office based upon the records of disbursements and collections.

COST DATA.

In the fifth annual report there appeared an article on cost keeping, setting forth the value and necessity therefor, and outlining a general plan for analyzing and recording such data. This system has been in operation in the Reclamation Service for about two years, and as contracts are completed from time to time useful information is being acquired and filed. As yet there has not been sufficient of these data collected to make the printing of them advisable. In connection with the cost data above referred to there has been kept a record of the lowest bid, next lowest bid, and contract unit prices on all items on which bids were received in the various specifications issued by the Service. This information was published to date in the fifth annual report, and is continued below for the fiscal year ended June 30, 1907.

UNIT PRICES.

In the tables below are given the unit prices of work on all the formal contracts entered into by the Reclamation Service between the publication of similar tables in the preceding annual report and June 30, 1907. In almost all cases contracts have been awarded to the lowest bidder, but as the contracts have been awarded on definite divisions of the work, as a whole it has frequently happened that the contract price for a particular item is higher than the lowest bid on that item. Wherever the word structures is used in the following tables without qualification it refers to the ordinary canal structures.

Unit prices on contract work.

BRIDGES (HIGHWAY).

State and project.	Date.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
					Lowest.	Next.	
Montana-North Dakota:							
Lower Yellowstone	Apr. 25, 1907	26-foot span combination trusses	Bridge	2	[a] $395.00	$419.75	Rejected.
		28-foot span combination trusses	do	2	[a] 414.00	432.50	Rejected.
		34-foot span combination trusses	do	5	[a] 412.00	496.10	Rejected.
		38-foot span combination trusses	do	4	[a] 423.00	544.65	Rejected.
		42-foot span combination trusses	do	3	[a] 448.00	585.20	Rejected.
		48-foot span combination trusses	do	2	[a] 648.00	758.00	Rejected.
		50-foot span combination trusses	do	1	[a] 664.00	774.00	Rejected.
		52-foot span combination trusses	do	1	[a] 672.00	783.00	Rejected.
		60-foot span combination trusses	do	1	1,765.70	.....	$1,765.70
		80-foot span combination trusses	do	2	2,630.50	.....	2,630.50
Nebraska:							
North Platte	June 2, 1907	54-foot span steel trusses	do	10	982.00	.....	982.00
		10-foot span wooden stringers	do	20	99.00	110.00	110.00
		14-foot span wooden stringers	do	18	130.00	134.00	130.00
		19-foot span wooden stringers	do	10	166.00	175.00	175.00
		Two 11-foot span wooden stringers	do	3	174.00	175.00	174.00
		Two 14-foot span wooden stringers	do	2	212.00	225.00	225.00
		Two 15-foot span wooden stringers	do	2	224.00	235.00	235.00
North Dakota:							
Buford-Trenton	Mar. 5, 1907	22-foot span wooden stringers	do	2	375.00	.....	375.00
		20-foot span wooden stringers	do	3	350.00	.....	350.00
		18-foot span wooden stringers	do	1	320.00	.....	320.00
		16-foot span wooden stringers	do	1	265.00	.....	265.00
		12-foot span wooden stringers	do	1	210.00	.....	210.00
		10-foot span wooden stringers	do	1	165.00	.....	165.00
		8-foot span wooden stringers	do	1	130.00	.....	130.00
South Dakota:							
Belle Fourche	Apr. 10, 1907	Two 20-foot span wooden stringers	do	6	390.00	.....	Rejected.
		Two 15-foot span wooden stringers	do	5	350.00	.....	Rejected.
	June 10, 1907	Two 20-foot span wooden stringers	do	6	375.00	450.00	Rejected.
		Two 18-foot span wooden stringers	do	5	360.00	425.00	Rejected.
Wyoming:							
Shoshone	May 15, 1907	60-foot span steel trusses	do	2	[b] 1,588.00	1,616.00	1,616.00

BUILDINGS.

Kansas:							

CEMENT.

Colorado:							
Uncompahgre	Apr. 15, 1907	f. o. b. at project	Barrel	30,000	$3.00	$3.075	$3.00
Kansas:							
Garden City	Sept. 28, 1906	f. o. b. Chicago	do	5,000	1.45		1.45
		f. o. b. Iola	do	5,000	1.60		Rejected.
Nebraska-Wyoming:							
North Platte and Shoshone.	July 27, 1906	f. o. b. Chicago	do	45,000	1.40		1.40
New Mexico:							
Rio Grande	Nov. 1, 1906	f. o. b. Independence	do	2,500	1.73	1.73	Rejected.
Utah:							
Strawberry Valley	Apr. 23, 1907	f. o. b. at project	do	10,000	2.90	2.99	2.90
Washington:							
Tieton and Sunnyside	Sept. 18, 1906	f. o. b. Chicago	do	27,000	1.45		2.00
		f. o. b. Tolenas	do	27,000	2.00		Rejected.
Wyoming:							
Shoshone	Mar. 12, 1907	f. o. b. Chicago	do	35,000	1.50		1.50

CLEARING AND GRUBBING.

Wyoming:							
North Platte	July 27 1907	Foundation for Pathfinder dike[d]	Acre	8	$10.00	$20.00	Rejected.

CONCRETE.[e]

Kansas:							
Garden City	July 28, 1906	Structures	Cubic yard	3,500	$8.10		Rejected.
Do	do	Structures (reinforced)	do	1,000	10.00		Rejected.
Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	do	do	750	12.00	$12.00	Rejected.
Do	do	Structures (plain)	do	650	10.00	11.50	Rejected.
Montana:							
St. Mary	July 31, 1906	Canal lining, 4 inches thick	do	5,000	19.50		Rejected.
Nebraska:							
North Platte	Nov. 1, 1906	Diversion dam and headworks (plain)	do	4,400	6.75		Rejected.
		Diversion dam and headworks (reinforced)	do	1,800	10.90		Rejected.
		Diversion dam and headworks revetment (reinforced)	do	500	11.95		Rejected.
		Diversion dam and headworks apron (reinforced)	do	500	11.95		Rejected.
	Jan. 9, 1907	Diversion dam and headworks (plain)	do	4,400	6.75	9.50	9.50
		Diversion dam and headworks (reinforced)	do	1,800	12.00	18.00	12.00
		Diversion dam and headworks revetment	do	500	9.00	17.00	9.00
		Diversion dam and headworks apron	do	500	10.00	18.00	10.00

[a] Metal only.
[b] Weight limited.
[c] 25½ by 31 by 20 feet to square; 2 stories, cellar, 2 porches, plumbing, furnace, and electric wiring.
[d] Site covered with light growth of sagebrush.
[e] Cement and reenforcing steel furnished in all cases by the United States.

Unit prices on contract work—Continued.

CONCRETE—Continued.

State and project.	Date.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
					Lowest.	Next.	
Nebraska—Continued.							
North Platte	June 2, 1907	Structures (plain), schedule 1	Cubic yard	1,350	$12.00		$12.00
		Structures (reenforced), schedule 1	do	2,420	15.50		15.50
		Structures (plain), schedule 2	do	156	13.00		13.00
		Structures (reenforced), schedule 2	do	235	16.50		16.50
		Bridge abutments (plain)	do	260	12.90	$13.00	13.00
New Mexico:							
Rio Grande	Oct. 16, 1906	Diversion dam and headworks (reinforced)	do	250	12.50		12.50
		Diversion dam and headworks (rubble)	do	2,350	9.45		9.45
North Dakota:							
Buford-Trenton	Mar. 5, 1907	Structures (plain)	do	40	9.00		9.00
		Structures (reenforced)	do	110	13.00		13.00
		Pumping station (plain)	do	145	10.50		10.50
		Pressure pipe (reenforced)	do	880	11.50		11.50
South Dakota:							
Belle Fourche	Apr. 10, 1907	Siphon and culvert, South canal, schedule 1, section 2	do	2,500	16.50		Rejected.
		Siphon, South canal, schedule 1, section 3	do	1,000	19.50		Rejected.
		Weirs and culverts, South canal, schedule 1, section 3	do	200	22.00		Rejected.
		Tunnel portal and lining, South canal, schedule 1, section 3	do	1,820	22.00		Rejected.
		Structures, South canal, schedule 2	do	1,600	22.00		Rejected.
	June 10, 1907	Siphon and culvert, South canal, schedule 1, section 2	do	2,500	13.50	16.00	Rejected.
		Siphon, South canal, schedule 1, section 3	do	1,000	16.00	16.50	Rejected.
		Weirs and culverts, South canal, schedule 1, section 3	do	200	14.00	18.00	Rejected.
		Tunnel portal, South canal, schedule 1, section 3	do	120	16.00	18.00	Rejected.
		Tunnel lining, South canal, schedule 1, section 3	do	1,700	18.00	20.00	Rejected.
		Structures, South canal, schedule 2	do	1,600	16.00	18.00	Rejected.
Wyoming:							
Shoshone	July 11, 1906	Structures, Garland canal:					
		Schedule 1, division 1	do	50	20.00		Rejected.
		Schedule 2, division 1	do	710	17.00		Rejected.
		Schedule 3, division 1	do	285	10.00	15.00	Rejected.
		Schedule 4, division 1	do	50	15.00		Rejected.
		Schedule 5, division 1	do	10	20.00		Rejected.
		Schedule 6, division 1	do	155	15.00		Rejected.
		Schedule 7, division 1	do	1,260	10.00	12.00	10.00
	Aug. 23, 1906	Schedule 1	do	200	15.30		15.30
		Schedule 2	do	200	15.00		15.00
		Schedule 3	do	1,100	15.00		15.00
		Schedule 4	do	225	16.00		16.00
		Schedule 5	do	75	16.50		16.50

CONCRETE PIPE.[a]

Montana:							
St. Mary	July 31, 1906	36-inch diameter	Foot	300	$7.50		Rejected.
		30-inch diameter	do	500	5.60		Rejected.
		24-inch diameter	do	900	3.85		Rejected.
		18-inch diameter	do	900	2.25		Rejected.

EXCAVATION, CLASS 1 (PLOWABLE WITH FOUR HORSES).

Kansas:							
Garden City	Oct. 15, 1906	Structures	Cubic yard	43,000	$0.25		Rejected.
Nebraska-Wyoming:							
North Platte	July 25, 1906	Distribution system:					
		Schedule 1	do	129,800	.175	$0.175	$0.175
		Schedule 2	do	37,000	.10	.18	.18
		Schedule 3	do	37,900	.11	.134	.15
		Schedule 4	do	79,000	.14	.1725	.14
		Schedule 5	do	65,000	.165	.175	.18
		Schedule 6	do	94,000	.098	.1295	.098
		Schedule 7	do	32,000	.16	.18	.18
		Schedule 8	do	76,400	.175	.18	.175
		Schedule 9	do	53,000	.1225	.125	.1225
		Schedule 10	do	19,000	.13	.18	.13
		Schedule 11	do	20,300	.125	.13	.125
		Schedule 12	do	24,400	.125	.18	.125
		Schedules 13 and 14	do	48,800	.155	.18	.155
	Nov. 1, 1906	Structures	do	10,000	.29		Rejected.
	Jan. 9, 1907	Diversion dam and head works:					
		Schedule 1	do	55,000	.30	.35	.30
		Schedule 2	do	9,000	.50	.60	1.00
	May 21, 1907	Laterals over 5 foot bottom width:					
		Schedule 1	do	92,000	.16	.18	.18
		Schedule 2	do	45,000	.159	.16	.165
		Schedule 3	do	140,200	.154	.16	.154
		Schedule 4	do	69,000	.15	.16	.15
		Schedule 5	do	95,400	.15	.154	.15
		Laterals under 5 foot bottom width:					
		Schedule 1	do	25,100	.17	.18	.18
		Schedule 2	do	49,700	.165	.17	.165
		Schedule 3	do	84,200	.16	.167	.167
		Schedules 4 and 5	do	63,000	.16	.17	.17
	June 2, 1907	Structures:					
		Schedules 1 and 2	do	20,300	.30		.30
		Schedule 3	do	4,000	(b)	(b)	
Oregon:							
Umatilla	Oct. 1, 1906	Structures	do	165,000	.1225		Rejected.

[a] Prices cover constructing and laying cement furnished by the United States. The pipes are used for drainage culverts.

[b] No bid.

Unit prices on contract work—Continued.

EXCAVATION, CLASS 1 A (MATERIAL PLOWABLE WITH SIX HORSES).

State and project. Date. Engineer.

		Structures, south canal:					
		Schedule 1, section 3	do	500	1.50		Rejected.
		Schedule 2	do	4,000	1.00		Rejected.
	Apr. 30, 1907	Laterals and structures:					
		Schedule 1, sections 1 and 2	do	106,000	.33⅓		Rejected.
		Schedule 1, section 3	do	40,000	.1625		.1625
		Schedule 1, section 5	do	24,000	.1675	.25	Rejected.
		Schedule 1, section 6	do	28,000	.1625	.225	Rejected.
		Schedule 1, section 7	do	62,000	.20	.23	.20
		Schedule 1, sections 8–11	do	232,000	.21		.21
	June 10, 1907	South canal:					
		Schedule 1, section 2	do	70,000	.26	.29	Rejected.
		Schedule 1, section 3	do	200,000	.30	.37	Rejected.
		Schedule 1, section 4	do	120,000	.25	.29	Rejected.
		Schedule 1, section 5	do	90,000	.27	.28	.27
		Schedule 1, section 6	do	100,000	.24	.245	.245
		Siphon, south canal:					
		Schedule 1, section 2	do	7,200	1.25	1.50	Rejected.
		Schedule 1, section 3	do	3,000	1.25	1.50	Rejected.
		Structures, south canal:					
		Schedule 1, section 3	do	500	1.30	1.50	Rejected.
		Schedule 2	do	4,000	1.00	1.00	Rejected.
Wyoming:							
Shoshone	July 11, 1906	Garland canal: Division 1, schedules 1, 2, 6	do	340,000	.26		Rejected.
		Garland canal:					
		Division 1, schedule 3	do	104,000	.24		Rejected.
		Division 1, schedule 4	do	58,000	.25		Rejected.
		Division 1, schedule 5	do	95,000	.25	.30	Rejected.
		Division 1, schedule 7	do	597,000	.23		Rejected.
	Aug. 23, 1906	Structures, Garland canal:					
		Division 1, schedule 1	do	50	1.00		1.00
		Division 1, schedule 2	do	4,500	.60		.60
		Division 1, schedule 3	do	12,500	.50		.50
		Division 1, schedules 4 and 5	do	100	.75		.75
	Mar. 12, 1907	Garland canal:					
		Division 2	do	112,000	.25		.25
		Division 3	do	95,000	.24	.30	.24
		Division 4	do	81,000	.28		.28
		Division 5	do	91,000	.20	.22	Rejected.
		Division 6	do	91,000	.20	.23	Rejected.
		Division 7	do	72,000	.20	.24	Rejected.
		Division 8	do	65,000	.22	.25	Rejected.
		Division 16	do	17,000	.20	.22	.20
		Divisions 9–15 and 17–19	do	211,500	.22	.22	.22

Unit prices on contract work—Continued.

CONCRETE—Continued.

State and project.	Date.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
					Lowest.	Next.	
Nebraska—Continued.							
North Platte	June 2, 1907	Structures (plain), schedule 1	Cubic yard	1,350	$12.00		$12.00
		Structures (reenforced), schedule 1	do	2,420	15.50		15.50
		Structures (plain), schedule 2	do	156	13.00		13.00
		Structures (reenforced), schedule 2	do	235	16.50		16.50
		Bridge abutments (plain)	do	260	12.90	$13.00	13.00
New Mexico:							
Rio Grande	Oct. 16, 1906	Diversion dam and headworks (reinforced)	do	250	12.50		12.50
		Diversion dam and headworks (rubble)	do	2,350	9.45		9.45
North Dakota:							
Buford-Trenton	Mar. 5, 1907	Structures (plain)	do	40	9.00		9.00
		Structures (reenforced)	do	110	13.00		13.00
		Pumping station (plain)	do	145	10.50		10.50
		Pressure pipe (reenforced)	do	880	11.50		11.50
South Dakota:							
Belle Fourche	Apr. 10, 1907	Siphon and culvert, South canal, schedule 1, section 2	do	2,500	16.50		Rejected.
		Siphon, South canal, schedule 1, section 3	do	1,000	19.50		Rejected.
		Weirs and culverts, South canal, schedule 1, section 3	do	200	22.00		Rejected.
		Tunnel portal and lining, South canal, schedule 1, section 3	do	1,820	22.00		Rejected.
		Structures, South canal, schedule 2	do	1,600	22.00		Rejected.
	June 10, 1907	Siphon and culvert, South canal, schedule 1, section 2	do	2,500	13.50	16.00	Rejected.
		Siphon, South canal, schedule 1, section 3	do	1,000	16.00	16.50	Rejected.
		Weirs and culverts, South canal, schedule 1, section 3	do	200	14.00	18.00	Rejected.
		Tunnel portal, South canal, schedule 1, section 3	do	120	16.00	18.00	Rejected.
		Tunnel lining, South canal, schedule 1, section 3	do	1,700	18.00	20.00	Rejected.
		Structures, South canal, schedule 2	do	1,600	16.00	18.00	Rejected.
Wyoming:							
Shoshone	July 11, 1906	Structures, Garland canal:					
		Schedule 1, division 1	do	50	20.00		Rejected.
		Schedule 2, division 1	do	710	17.00		Rejected.
		Schedule 3, division 1	do	285	10.00	15.00	Rejected.
		Schedule 4, division 1	do	50	15.00		Rejected.
		Schedule 5, division 1	do	10	20.00		Rejected.
		Schedule 6, division 1	do	155	15.00		Rejected.
		Schedule 7, division 1	do	1,260	10.00	12.00	10.00
	Aug. 23, 1906	Schedule 1	do	200	15.30		15.30
		Schedule 2	do	200	15.00		15.00
		Schedule 3	do	1,100	15.00		15.00
		Schedule 4	do	225	16.00		16.00
		Schedule 5	do	75	16.50		16.50

CONCRETE PIPE.[a]

Montana:							
St. Mary	July 31, 1906	36-inch diameter	Foot	300	$7.50		Rejected.
		30-inch diameter	do	500	5.60		Rejected.
		24-inch diameter	do	900	3.85		Rejected.
		18-inch diameter	do	900	2.25		Rejected.

EXCAVATION, CLASS 1 (PLOWABLE WITH FOUR HORSES).

Kansas:							
Garden City	Oct. 15, 1906	Structures	Cubic yard	43,000	$0.25		Rejected.
Nebraska-Wyoming:							
North Platte	July 25, 1906	Distribution system:					
		Schedule 1	do	129,800	.175	$0.175	$0.175
		Schedule 2	do	37,000	.10	.18	.18
		Schedule 3	do	37,900	.11	.134	.15
		Schedule 4	do	79,000	.14	.1725	.14
		Schedule 5	do	65,000	.165	.175	.18
		Schedule 6	do	94,000	.098	.1295	.098
		Schedule 7	do	32,000	.16	.18	.18
		Schedule 8	do	76,400	.175	.18	.175
		Schedule 9	do	53,000	.1225	.125	.1225
		Schedule 10	do	19,000	.13	.18	.13
		Schedule 11	do	20,300	.125	.13	.125
		Schedule 12	do	24,400	.125	.18	.125
		Schedules 13 and 14	do	48,800	.155	.18	.155
	Nov. 1, 1906	Structures	do	10,000	.29		Rejected.
	Jan. 9, 1907	Diversion dam and head works:					
		Schedule 1	do	55,000	.30	.35	.30
		Schedule 2	do	9,000	.50	.60	1.00
	May 21, 1907	Laterals over 5 foot bottom width:					
		Schedule 1	do	92,000	.16	.18	.18
		Schedule 2	do	45,000	.159	.16	.165
		Schedule 3	do	140,200	.154	.16	.154
		Schedule 4	do	69,000	.15	.16	.15
		Schedule 5	do	95,400	.15	.154	.15
		Laterals under 5 foot bottom width:					
		Schedule 1	do	25,100	.17	.18	.18
		Schedule 2	do	49,700	.165	.17	.165
		Schedule 3	do	84,200	.16	.167	.167
		Schedules 4 and 5	do	63,000	.16	.17	.17
	June 2, 1907	Structures:					
		Schedules 1 and 2	do	20,300	.30		.30
		Schedule 3	do	4,000	(b)	(b)	
Oregon:							
Umatilla	Oct. 1, 1906	Structures	do	165,000	.1225		Rejected.

[a] Prices cover constructing and laying cement furnished by the United States. The pipes are used for drainage culverts.

[b] No bid.

Unit prices on contract work—Continued.

EXCAVATION, CLASS 1 A (MATERIAL PLOWABLE WITH SIX HORSES).

State and project.	Date.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
					Lowest.	Next.	
Kansas:							
Garden City	Sept. 28, 1906	Structures	Cubic yard	43,000	$0.25		Rejected.
Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	Laterals:					
		Schedules 1 and 3	do	166,800	.25		$0.25
		Schedule 2	do	220,000	.23	$0.24	.23
		Waste ditches:					
		Schedule 1	do	37,000	.30		.30
		Schedule 2	do	53,900	.27	.30	.30
		Schedule 3	do	33,000	.31		.31
Montana:							
St. Mary	July 31, 1906	Main canal	do	1,400,000	.2275		Rejected.
Sun River	Apr. 3, 1907	Canals and structures:					
		Division 1	do	133,000	.29	.33	.29
		Division 2	do	75,000	.30	.35	.30
		Divisions 3 and 4	do	155,000	.30	.30	.30
		Division 5	do	75,000	.25	.30	.25
New Mexico:							
Rio Grande	Oct. 16, 1906	Headworks	do	126,000	.25		.25
		Canal	do	128,000	.18		.18
		Change of river channel	do	40,000	.16	.18	.16
North Dakota:							
Buford-Trenton	Mar. 5, 1907	Canals and structures	do	32,000	.235		.235
Oregon:							
Klamath	Apr. 15, 1907	Keno Canal, schedules 1-4	do	47,080	.75		Rejected.
Umatilla	Oct. 1, 1906	Distribution system:					
		Schedule 1	do	165,000	.1225	.179	.1225
		Schedule 2	do	150,000	.199	.20	Rejected.
		Structures	do	165,000	.1225		Rejected.
South Dakota:							
Belle Fourche	Apr. 10, 1907	South canal:					
		Schedule 1, section 2	do	70,000	.30		Rejected.
		Schedule 1, section 3	do	200,000	.39		Rejected.
		Schedule 1, section 4	do	120,000	.32		Rejected.
		Schedule 1, section 5	do	90,000	.31	.32	Rejected.
		Schedule 1, section 6	do	100,000	.165	.29	Rejected.
		Schedule 1, section 7	do	100,000	.17	.29	.17
		Schedule 1, section 8	do	120,000	.19	.29	.19
		Siphon, south canal:					
		Schedule 1, section 2	do	7,000	1.85		Rejected.
		Schedule 1, section 3	do	3,000	2.00		Rejected.

		Structures, south canal:					
		Schedule 1, section 3	do	500	1.50		Rejected.
		Schedule 2	do	4,000	1.00		Rejected.
	Apr. 30, 1907	Laterals and structures:					
		Schedule 1, sections 1 and 2	do	106,000	.33⅓		Rejected.
		Schedule 1, section 3	do	40,000	.1625		.1625
		Schedule 1, section 5	do	24,000	.1675	.25	Rejected.
		Schedule 1, section 6	do	28,000	.1625	.225	Rejected.
		Schedule 1, section 7	do	62,000	.20	.23	.20
		Schedule 1, sections 8–11	do	232,000	.21		.21
	June 10, 1907	South canal:					
		Schedule 1, section 2	do	70,000	.26	.29	Rejected.
		Schedule 1, section 3	do	200,000	.30	.37	Rejected.
		Schedule 1, section 4	do	120,000	.25	.29	Rejected.
		Schedule 1, section 5	do	90,000	.27	.28	.27
		Schedule 1, section 6	do	100,000	.24	.245	.245
		Siphon, south canal:					
		Schedule 1, section 2	do	7,200	1.25	1.50	Rejected.
		Schedule 1, section 3	do	3,000	1.25	1.50	Rejected.
		Structures, south canal:					
		Schedule 1, section 3	do	500	1.30	1.50	Rejected.
		Schedule 2	do	4,000	1.00	1.00	Rejected.
Wyoming:							
Shoshone	July 11, 1906	Garland canal: Division 1, schedules 1, 2, 6	do	340,000	.26		Rejected.
		Garland canal:					
		Division 1, schedule 3	do	104,000	.24		Rejected.
		Division 1, schedule 4	do	58,000	.25		Rejected.
		Division 1, schedule 5	do	95,000	.25	.30	Rejected.
		Division 1, schedule 7	do	597,000	.23		Rejected.
	Aug. 23, 1906	Structures, Garland canal:					
		Division 1, schedule 1	do	50	1.00		1.00
		Division 1, schedule 2	do	4,500	.60		.60
		Division 1, schedule 3	do	12,500	.50		.50
		Division 1, schedules 4 and 5	do	100	.75		.75
	Mar. 12, 1907	Garland canal:					
		Division 2	do	112,000	.25		.25
		Division 3	do	95,000	.24	.30	.24
		Division 4	do	81,000	.28		.28
		Division 5	do	91,000	.20	.22	Rejected.
		Division 6	do	91,000	.20	.23	Rejected.
		Division 7	do	72,000	.20	.24	Rejected.
		Division 8	do	65,000	.22	.25	Rejected.
		Division 16	do	17,000	.20	.22	.20
		Divisions 9–15 and 17–19	do	211,500	.22	.22	.22

Unit prices on contract work—Continued.

EXCAVATION, CLASS 2 (INDURATED MATERIAL).

State and project.	Date.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
					Lowest.	Next.	
Kansas:							
Garden City	Sept. 28, 1906	Structures	Cubic yard	100	$1.00		Rejected.
Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	Laterals:					
		Schedules 1 and 3	do	2,400	.35		$0.35
		Schedule 2	do	900	.33	$0.35	.33
		Ditches:					
		Schedules 1 and 3	do	500	.35		.35
		Schedule 2	do	250	.35	.40	.35
		Structures	do	10	.80	.90	Rejected.
Montana:							
Sun River	Apr. 3, 1907	Canals and structures:					
		Division 1	do	10,000	.60	.65	.65
		Division 2	do	2,000	.55	.75	.55
		Division 3	do	500	.60	.65	.60
		Division 4	do	5,000	.60	.65	.75
		Division 5	do	500	.60	.60	.75
Nebraska-Wyoming:							
North Platte	July 25, 1906	Distribution system:					
		Schedule 1	do	100	.40	.65	.40
		Schedule 2	do	1,000	.25	.50	.65
		Schedule 3	do	2,000	.48	.50	.50
		Schedule 4	do	100	.40	.48	.40
		Schedule 5	do	1,000	.40	.65	.65
		Schedule 6	do	200	.40	.40	.40
		Schedule 7	do	400	.48	.65	.65
		Schedule 8	do	100	.48	.65	.48
		Schedule 9	do	400	.40	.48	.60
		Schedules 10–12	do	500	.60	.65	.60
		Schedules 13 and 14	do	200	.50	.65	.50
	Nov. 1, 1906	Structures	do	2,000	1.90		Rejected.
Nebraska:							
North Platte	Jan. 9, 1907	Diversion dam	do	1,000	1.50	2.00	2.00
		Laterals over 5-foot bottom width:					
		Schedule 1	do	4,000	.60	.60	.65
		Schedule 2	do	200	.35	.50	.50
		Schedule 3	do	400	.35	.45	.80
		Schedule 4	do	300	.35	.50	.60
		Schedule 5	do	400	.35	.35	.60
		Laterals under 5-foot bottom width:					
		Schedule 1	do	200	.60	.60	.65
		Schedule 2	do	300	.35	.50	.50

		Schedule 3	do	100	.35	.45	.80
		Schedules 4 and 5	do	350	.35	.50	.60
	June 2, 1907	Structures, schedules 1 and 2	do	200	1.00		1.00
North Dakota:							
Buford-Trenton	Mar. 5, 1907	Canals and structures	do	100	.75		.75
Oregon:							
Klamath	Apr. 15, 1907	Keno canal, schedules 1–4	do	15,710	.85		Rejected.
South Dakota:							
Belle Fourche	Apr. 10, 1907	Canals:					
		Schedule 1, section 2	do	2,000	.80		Rejected.
		Schedule 1, section 3	do	25,000	.39		Rejected.
		Schedule 1, section 4	do	15,000	.32		Rejected.
		South canal:					
		Schedule 1, section 5	do	10,000	.32	.80	Rejected.
		Schedule 1, section 6	do	3,000	.29	.30	Rejected.
		Schedule 1, sections 7 and 8	do	8,000	.29	.40	.40
		Siphon, South canal:					
		Schedule 1, section 2	do	500	1.85		Rejected.
		Schedule 1, section 3	do	300	2.00		Rejected.
		Structures, South canal:					
		Schedule 1, section 3	do	300	1.50		Rejected.
		Schedule 2	do	300	1.00		Rejected.
	Apr. 30, 1907	Laterals and structures:					
		Schedule 1, sections 1 and 2	do	2,000	.65		Rejected.
		Schedule 1, section 3	do	500	.60		.60
		Schedule 1, section 4	do	(a)	(a)	(a)	
		Schedule 1, sections 5 and 6	do	1,000	.30	.50	Rejected.
		Schedule 1, section 7	do	500	.30	.75	.30
		Schedule 1, sections 8–11	do	3,800	.75		.75
	June 10, 1907	South canal:					
		Schedule 1, section 2	do	2,000	.29	.75	Rejected.
		Schedule 1, section 3	do	25,000	.38	.85	Rejected.
		Schedule 1, section 4	do	15,000	.40	.50	Rejected.
		Schedule 1, sections 5 and 6	do	13,000	.40	.50	.50
		Siphon, South canal:					
		Schedule 1, section 2	do	500	1.50	2.10	Rejected.
		Schedule 1, section 3	do	300	1.25	2.00	Rejected.
		Structures, South canal:					
		Schedule 1, section 3	do	300	1.30	2.00	Rejected.
		Schedule 2	do	300	1.00	1.00	Rejected.
Wyoming:							
Shoshone	July 11, 1906	Garland canal, division 1:					
		Schedules 1, 2, 4, and 6	do	14,300	.60		Rejected.
		Schedules 3 and 5	do	200	.60	1.00	Rejected.
		Schedule 7	do	14,500	.60	.75	.60
	Mar. 12, 1907	Garland canal, division 2:					
		Schedules 2 and 4	do	4,500	.60		.60
		Schedule 3	do	2,500	.50	.60	.50
		Schedules 5–8	do	25,000	.50	.60	Rejected.
		Schedule 16	do	700	.50	.70	.50
		Schedules 9–15, 17–19, inclusive	do	6,600	.50	.70	.50

[a] No bid.

Unit prices on contract work—Continued.
EXCAVATION CLASS 3 (LOOSE ROCK.)

State and project.	Date.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
					Lowest.	Next.	
Kansas:							
Garden City	Sept. 28, 1906	Structures		100	$0.50		Rejected.
Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	Laterals:					
		Schedules 1 and 3	Cubic yard	1,200	.60		$0.60
		Schedule 2	do	500	.60	$0.60	.60
		Waste ditches:					
		Schedules 1 and 3	do	400	.60		.60
		Schedule 2	do	250	.60	.75	.60
		Structures	do	10	.95	1.00	Rejected.
Montana:							
St. Mary	July 13, 1906	Main canal	do	202,000	.6525		Rejected.
Nebraska-Wyoming:							
North Platte	May 21, 1907	Laterals over 5-foot bottom width:					
		Schedule 1	do	100	.65	.75	.65
		Schedule 2	do	100	.35	.75	.75
		Schedule 3	do	100	.25	.35	.80
		Schedule 4	do	100	.35	.60	.75
		Schedule 5	do	100	.35	.40	.75
		Laterals under 5-foot bottom width:					
		Schedule 1	do	100	.65	.75	.65
		Schedule 2	do	100	.35	.75	.75
		Schedule 3	do	100	.25	.35	.80
		Schedule 4	do	100	.35	.60	.75
		Schedule 5	do	100	.35	.40	.75
	June 26, 1907	Structures, Schedule 1	do	3,500	1.00		1.00
	July 25, 1906	Distribution system:					
		Schedule 1	do	100	.40	.40	.40
		Schedule 2	do	1,000	.40	.55	.75
		Schedules 3 and 4	do	200	.40	.40	.50
		Schedule 5	do	200	.40	.50	.75
		Schedule 6	do	100	.40	.40	.45
		Schedule 7	do	100	.40	.65	.65
		Schedule 8	do	100	.40	.65	.40
		Schedule 9	do	100	.40	.40	.75
		Schedules 10–12	do	300	.65	.75	.75
		Schedule 13	do	100	.50	.65	.50
		Schedule 14	do	100	.75	.80	.80
North Dakota:							
Buford-Trenton	Mar. 5, 1907	Canal and structures	do	25	1.50		1.50
Wyoming:							
Shoshone	Aug. 23, 1906	Garland canal structures:					
		Schedule 1	do	50	3.00		3.00
		Schedules 2–5	do	180	2.00		2.00

EXCAVATION CLASS 4 (SOLID ROCK).

Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	Laterals:					
		Schedule 1	Cubic yard	80	$1.60		$1.60
		Schedule 2	do	50	1.50	$1.50	1.50
		Schedule 3	do	40	1.50		1.50
		Waste ditches:					
		Schedule 1	do	50	1.50		1.60
		Schedules 2 and 3	do	80	1.50		1.50
		Structures	do	10	1.00	1.25	Rejected.
Montana:							
St. Mary	July 31, 1906	Main canal	do	111,000	1.80		Rejected.
Sun River	Apr. 3, 1907	Canals and structures:					
		Division 1	do	500	1.00	3.00	3.00
		Division 2	do	200	1.00	1.25	1.25
		Division 3	do	100	1.00	1.20	1.20
		Division 4	do	500	1.00	1.00	1.00
		Division 5	do	100	.90	1.00	.90
Nebraska:							
North Platte	July 25, 1906	Interstate canal distribution system:					
		Schedule 1	do	100	.80	.90	.80
		Schedule 2	do	100	.65	.90	1.00
		Schedule 3	do	100	.65	.80	80
		Schedule 4	do	100	.60	.80	.60
		Schedules 5 and 9	do	200	.80	.90	1.00
		Schedule 6	do	100	.55	.60	.55
		Schedule 7	do	100	.90	1.00	.90
		Schedules 8 and 14	do	200	.90	1.00	1.25
		Schedules 10 and 11	do	200	.90	.90	.90
		Schedule 12	do	100	.90	1.00	1.00
		Schedule 13	do	100	.75	.90	.75
	Nov. 1, 1906	Structures	do	15,000	1.90		Rejected.
	Jan. 9, 1907	Diversion dam, schedule 2	do	7,000	2.20	2.50	3.00
	May 21, 1907	Laterals over 5-foot bottom width:					
		Schedule 1	do	7,000	.85	.85	.85
		Schedule 2	do	100	.65	.85	.90
		Schedule 3	do	700	.50	.75	1.00
		Schedule 4	do	300	.50	.75	.90
		Schedule 5	do	600	.50	.75	.90
		Laterals under 5-foot bottom width:					
		Schedule 1	do	100	.85	.85	.85
		Schedule 2	do	600	.65	.85	.90
		Schedule 3	do	100	.50	.75	1.00
		Schedules 4 and 5	do	350	.50	.75	.90
	June 20, 1907	Structures, schedule 1	do	300	5.00		5.00
New Mexico:							
Rio Grande	Oct. 16, 1906	Canal head works	do	600	2.00		2.00
		Canal	do	4,300	1.20		1.20
North Dakota:							
Buford-Trenton	Mar. 5, 1907	Canals and structures	do	25	2.50		2.50
Oregon:							
Klamath	Apr. 15, 1907	Keno canal, schedules 1-4	do	13,340	1.00		Rejected.

Unit prices on contract work—Continued.

EXCAVATION CLASS 4 (SOLID ROCK)—Continued.

State and project.	Date.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
					Lowest.	Next.	
South Dakota:							
Belle Fourche	Apr. 10, 1907	South canal:					
		Schedule 1, section 2	Cubic yard	300	$0.30		Rejected.
		Schedule 1, section 3	do	1,500	.39		Rejected.
		Schedule 1, section 4	do	2,000	.32		Rejected.
		Schedule 1, section 5	do	1,000	.32	$4.50	Rejected.
		Schedule 1, section 6	do	500	.29	1.00	Rejected.
		Schedule 1, sections 7 and 8	do	1,500	.29	1.00	$1.00
		Siphon and culvert, south canal:					
		Schedule 1, section 2	do	100	1.85		Rejected.
		Schedule 1, section 3	do	100	2.00		Rejected.
		Structures south canal, schedule 1, section 2	do	100	1.00		Rejected.
	Apr. 30, 1907	Laterals and structures:					
		Schedule 1, sections 1 and 2	do	350	1.50		Rejected.
		Schedule 1, section 3	do	200	1.00		1.00
		Schedule 1, section 4	do	200	No bid.	No bid.	
		Schedule 1, sections 5 and 6	do	400	.75	1.00	Rejected.
		Schedule 1, section 7	do	200	.75	1.25	.75
		Schedule 1, sections 8–11	do	1,150	1.25		1.25
	June 10, 1907	South canal:					
		Schedule 1, section 2	do	300	.29	1.00	Rejected.
		Schedule 1, section 3	do	1,500	.38	1.00	Rejected.
		Schedule 1, section 4	do	2,000	.50	.82	Rejected.
		Schedule 1, sections 5 and 6	do	1,500	.50	.82	1.00
		Siphon:					
		Schedule 1, section 2	do	100	1.50	2.10	Rejected.
		Schedule 1, section 3	do	100	1.50	2.00	Rejected.
		Structures, schedule 2	do	100	1.00	1.00	Rejected.
Wyoming:							
Shoshone	July 11, 1906	Garland canal:					
		Division 1, schedules 1, 2, 4, and 6	do	81,000	1.25		Rejected.
		Division 1, schedules 3 and 5	do	600	1.25	1.50	Rejected.
		Division 1, schedule 7	do	81,700	1.05	1.15	1.15
	Aug. 23, 1906	Garland canal, structures:					
		Schedule 1	do	50	5.00		5.00
		Schedules 2, 3, 4, and 5	do	150	4.00		4.00
	Apr. 12, 1907	Garland canal:					
		Divisions 2 and 4	do	5,500	1.00		1.00
		Division 3	do	500	1.00	1.00	1.00
		Divisions 5–8	do	21,000	1.00	1.00	Rejected.
		Division 16	do	400	1.00	1.10	1.00
		Divisions 9–15, 17–19	do	4,700	1.00	1.10	1.00

EXCAVATION, CLASS 4 B (EXCAVATION BELOW PLANE OF SATURATION).

Kansas:							
Garden City	Sept. 28, 1906	Structures	Cubic yard	240	(a)		Rejected.
Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	do	do	100	$5.00	$6.00	Rejected.
Nebraska:							
North Platte	Jan. 9, 1907	Diversion dam	do	5,000	3.00	4.00	$3.00
New Mexico:							
Rio Grande	Oct. 16, 1906	Canal head works	do	9,000	.35		.35
		Canal	do	600	.25		.25
		Change of river channel	do	1,500	.20	.50	.20
South Dakota:							
Belle Fourche	Apr. 10, 1907	Siphon, South canal:					
		Schedule 1, sections 2 and 3	do	3,430	4.00		Rejected.
	June 10, 1907	Schedule 1, section 2	do	2,400	2.10	3.00	Rejected.
		Schedule 1, section 3	do	1,050	2.00	3.00	Rejected.
Wyoming:							
Shoshone	Oct. 6, 1906	Corbett dam	do	3,000	1.30	2.30	2.30

EXCAVATION, CLASS 4 B (SOLID ROCK UNDER WATER).

Nebraska:							
North Platte	Jan. 9, 1907	Diversion dam	Cubic yard	2,000	$4.50	$5.75	$4.50
Wyoming:							
Shoshone	Jan. 11, 1906	Corbett dam	do	1,500	4.65	4.90	4.65

GATES AND GUIDES.

Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	Sluice gates and frames	Pounds	100	$0.05	$0.07	Rejected.
Nebraska:							
North Platte	June 2, 1907	Handling, hauling, and setting	do	70,000	.025		$0.025
		Sluice gates, frames, etc	do	53,000	.080	.157	.080
		20 lateral head gates	do	17,000	.070	.080	.080
New Mexico:							
Rio Grande	Nov. 15, 1906	Gates, guides, and grating bars	do	4,500	.050	.055	.050

a Cost plus 15 per cent.

Unit prices on contract work—Continued.

GRAVEL (FOUNDATIONS AND RIPRAP).

State and project.	Date.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
					Lowest.	Next.	
Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	Riprap for canal	Cubic yard	200	$2.50	$3.00	Rejected.
Nebraska:							
North Platte	Jan. 9, 1907	....do	....do	6,600	2.50	3.00	$3.00
South Dakota:							
Belle Fourche	Apr. 10, 1907	Foundations for concrete (screened)	....do	150	5.00	.....	Rejected.
	June 10, 1907	....do	....do	150	3.00	5.00	Rejected.
Wyoming:							
Shoshone	July 11, 1906	Foundations for concrete	....do	430	.90	1.00	.90

LATERALS TO CARRY 5 SECOND-FEET.

North Dakota:							
Buford-Trenton	Mar. 5, 1907	Distributing system	Mile	9.0	$320.00	.....	$320.00
Wyoming:							
Shoshone	Mar. 12, 1907	Division 2	....do	3.5	352.00	.....	352.00
		Divisions 3 and 6-8	....do	15.0	300.00	$352.00	Rejected.
		Divisions 9-15 and 17-19	....do	46.4	300.00	352.00	300.00
		Division 16	....do	3.7	150.00	352.00	150.00

LATERALS TO CARRY 10 SECOND-FEET.

North Dakota:							
Buford-Trenton	Mar. 5, 1907	Distributing system	Mile	1.0	$340.00	.....	$340.00
Wyoming:							
Shoshone	Mar. 12, 1907	Division 2	....do	1.9	880.00	.....	880.00
		Divisions 5-8	....do	6.5	300.00	$880.00	Rejected.
		Divisions 9-15 and 17-19	....do	25.3	300.00	880.00	300.00
		Division 16	....do	3.4	160.00	880.00	160.00

LATERALS TO CARRY 15 SECOND-FEET.

Wyoming:							
Shoshone	Mar. 12, 1907	Divisions 5-7	Mile	2.0	$300.00	$1,368.00	Rejected.
		Divisions 9-15 and 17-19	....do	5.2	300.00	1,368.00	$300.00
		Division 16	....do	2.0	170.00	1,368.00	170.00

LAYING PIPE.

South Dakota:							
Belle Fourche	June 10, 1907	24-inch culverts [a]	Linear foot	100	$1.50	$2.00	Rejected.
Wyoming:							
Shoshone	July 11, 1906	12-inch culverts [b]	do	100	.70	1.50	$1.50
		30-inch culverts [b]	do	1,060	1.50	2.00	2.00

LIFTING DEVICES.

Nebraska:							
North Platte	Jan. 24, 1907	Regulating gates [c]	Lifting device	9	$48.84	$71.40	$80.71
		Scouring gates [d]	do	4	65.94	98.90	102.52
	June 26, 1907	Sluice gates [c]	do	16	50.00	85.00	85.00
		Lateral head gates [e]	do	20	35.00	60.00	60.00
		Small wooden lateral head gates [f]	do	31	27.80	29.00	29.00

LUMBER.[g]

				Feet.			
Kansas:							
Garden City	July 10, 1906	For house	M Feet B. M		$58.00		Rejected.
Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	Structures, S. 1 S. & 1 E.	do	200,000	70.00	$75.00	Rejected.
		Structures, rough	do	100,000	68.00	70.00	Rejected.
Nebraska:							
North Platte	June 2, 1907	Structures	do	7,000	70.00		$70.00
North Dakota:							
Buford-Trenton	Mar. 5, 1907	Flume and turnouts	do	16,200	80.00		80.00
South Dakota:							
Belle Fourche	Apr. 10, 1907	Platforms and drains	do	20,000	70.00		80.00
		Platforms	do	20,000	70.00	70.00	Rejected.
North Dakota:							
Buford-Trenton	Mar. 5, 1907	Class 2	do	5,500	65.00		65.00
		Culverts	do	3,000	60.00		60.00
Wyoming:							
Shoshone	July 11, 1906	Bridge floor	do	500	50.00	50.00	50.00

[a] Laid with cement joints and back-filled.
[b] Laid with cement joints on gravel foundation and back-filled.
[c] Complete, including steel gate stem for lifting 10,000 pounds.
[d] Complete, including steel gate stem for lifting 20,000 pounds.
[e] Complete, including steel gate stem for lifting 2,500 pounds.
[f] Complete, including steel gate stem for lifting 500 pounds.
[g] Prices are for lumber in place.

Unit prices on contract work—Continued.

EXCAVATION, CLASS 2 (INDURATED MATERIAL).

State and project.	Date.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
					Lowest.	Next.	
Kansas:							
Garden City	Sept. 28, 1906	Structures	Cubic yard	100	$1.00		Rejected.
Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	Laterals:					
		Schedules 1 and 3	do	2,400	.35		$0.35
		Schedule 2	do	900	.33	$0.35	.33
		Ditches:					
		Schedules 1 and 3	do	500	.35		.35
		Schedule 2	do	250	.35	.40	.35
		Structures	do	10	.80	.90	Rejected.
Montana:							
Sun River	Apr. 3, 1907	Canals and structures:					
		Division 1	do	10,000	.60	.65	.65
		Division 2	do	2,000	.55	.75	.55
		Division 3	do	500	.60	.65	.60
		Division 4	do	5,000	.60	.65	.75
		Division 5	do	500	.60	.60	.75
Nebraska-Wyoming:							
North Platte	July 25, 1906	Distribution system:					
		Schedule 1	do	100	.40	.65	.40
		Schedule 2	do	1,000	.25	.50	.65
		Schedule 3	do	2,000	.48	.50	.50
		Schedule 4	do	100	.40	.48	.40
		Schedule 5	do	1,000	.40	.65	.65
		Schedule 6	do	200	.40	.40	.40
		Schedule 7	do	400	.48	.65	.65
		Schedule 8	do	100	.48	.65	.48
		Schedule 9	do	400	.40	.48	.60
		Schedules 10–12	do	500	.60	.65	.60
		Schedules 13 and 14	do	200	.50	.65	.50
	Nov. 1, 1906	Structures	do	2,000	1.90		Rejected.
Nebraska:							
North Platte	Jan. 9, 1907	Diversion dam	do	1,000	1.50	2.00	2.00
		Laterals over 5-foot bottom width:					
		Schedule 1	do	4,000	.60	.60	.65
		Schedule 2	do	200	.35	.50	.50
		Schedule 3	do	400	.35	.45	.80
		Schedule 4	do	300	.35	.50	.60
		Schedule 5	do	400	.35	.35	.60
		Laterals under 5-foot bottom width:					
		Schedule 1	do	200	.60	.60	.65
		Schedule 2	do	300	.35	.50	.50

		Schedule 3	do	100	.35	.45	.80
		Schedules 4 and 5	do	350	.35	.50	.60
	June 2, 1907	Structures, schedules 1 and 2	do	200	1.00		1.00
North Dakota:							
Buford-Trenton	Mar. 5, 1907	Canals and structures	do	100	.75		.75
Oregon:							
Klamath	Apr. 15, 1907	Keno canal, schedules 1–4	do	15,710	.85		Rejected.
South Dakota:							
Belle Fourche	Apr. 10, 1907	Canals:					
		Schedule 1, section 2	do	2,000	.30		Rejected.
		Schedule 1, section 3	do	25,000	.39		Rejected.
		Schedule 1, section 4	do	15,000	.32		Rejected.
		South canal:					
		Schedule 1, section 5	do	10,000	.32	.80	Rejected.
		Schedule 1, section 6	do	3,000	.29	.30	Rejected.
		Schedule 1, sections 7 and 8	do	8,000	.29	.40	.40
		Siphon, South canal:					
		Schedule 1, section 2	do	500	1.85		Rejected.
		Schedule 1, section 3	do	300	2.00		Rejected.
		Structures, South canal:					
		Schedule 1, section 3	do	300	1.50		Rejected.
		Schedule 2	do	300	1.00		Rejected.
	Apr. 30, 1907	Laterals and structures:					
		Schedule 1, sections 1 and 2	do	2,000	.65		Rejected.
		Schedule 1, section 3	do	500	.60		.60
		Schedule 1, section 4	do	(a)	(a)	(a)	
		Schedule 1, sections 5 and 6	do	1,000	.30	.50	Rejected.
		Schedule 1, section 7	do	500	.30	.75	.30
		Schedule 1, sections 8–11	do	3,800	.75		.75
	June 10, 1907	South canal:					
		Schedule 1, section 2	do	2,000	.29	.75	Rejected.
		Schedule 1, section 3	do	25,000	.38	.85	Rejected.
		Schedule 1, section 4	do	15,000	.40	.50	Rejected.
		Schedule 1, sections 5 and 6	do	13,000	.40	.50	.50
		Siphon, South canal:					
		Schedule 1, section 2	do	500	1.50	2.10	Rejected.
		Schedule 1, section 3	do	300	1.25	2.00	Rejected.
		Structures, South canal:					
		Schedule 1, section 3	do	300	1.30	2.00	Rejected.
		Schedule 2	do	300	1.00	1.00	Rejected.
Wyoming:							
Shoshone	July 11, 1906	Garland canal, division 1:					
		Schedules 1, 2, 4, and 6	do	14,300	.60		Rejected.
		Schedules 3 and 5	do	200	.60	1.00	Rejected.
		Schedule 7	do	14,500	.60	.75	.60
	Mar. 12, 1907	Garland canal, division 2:					
		Schedules 2 and 4	do	4,500	.60		.60
		Schedule 3	do	2,500	.50	.60	.50
		Schedules 5–8	do	25,000	.50	.60	Rejected.
		Schedule 16	do	700	.50	.70	.50
		Schedules 9–15, 17–19, inclusive	do	6,600	.50	.70	.50

(a) No bid.

Unit prices on contract work—Continued.
EXCAVATION CLASS 3 (LOOSE ROCK.)

State and project.	Date.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
					Lowest.	Next.	
Kansas:							
Garden City	Sept. 28, 1906	Structures		100	$0.50		Rejected.
Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	Laterals:					
		Schedules 1 and 3	Cubic yard	1,200	.60		$0.60
		Schedule 2	do	500	.60	$0.60	.60
		Waste ditches:					
		Schedules 1 and 3	do	400	.60		.60
		Schedule 2	do	250	.60	.75	.60
		Structures	do	10	.95	1.00	Rejected.
Montana:							
St. Mary	July 13, 1906	Main canal	do	202,000	.6525		Rejected.
Nebraska-Wyoming:							
North Platte	May 21, 1907	Laterals over 5-foot bottom width:					
		Schedule 1	do	100	.65	.75	.65
		Schedule 2	do	100	.35	.75	.75
		Schedule 3	do	100	.25	.35	.80
		Schedule 4	do	100	.35	.60	.75
		Schedule 5	do	100	.35	.40	.75
		Laterals under 5-foot bottom width:					
		Schedule 1	do	100	.65	.75	.65
		Schedule 2	do	100	.35	.75	.75
		Schedule 3	do	100	.25	.35	.80
		Schedule 4	do	100	.35	.60	.75
		Schedule 5	do	100	.35	.40	.75
	June 26, 1907	Structures, Schedule 1	do	3,500	1.00		1.00
	July 25, 1906	Distribution system:					
		Schedule 1	do	100	.40	.40	.40
		Schedule 2	do	1,000	.40	.55	.75
		Schedules 3 and 4	do	200	.40	.40	.50
		Schedule 5	do	200	.40	.50	.75
		Schedule 6	do	100	.40	.40	.45
		Schedule 7	do	100	.40	.65	.65
		Schedule 8	do	100	.40	.65	.40
		Schedule 9	do	100	.40	.40	.75
		Schedules 10–12	do	300	.65	.75	.75
		Schedule 13	do	100	.50	.65	.50
		Schedule 14	do	100	.75	.80	.80
North Dakota:							
Buford-Trenton	Mar. 5, 1907	Canal and structures	do	25	1.50		1.50
Wyoming:							
Shoshone	Aug. 23, 1906	Garland canal structures:					
		Schedule 1	do	50	3.00		3.00
		Schedules 2–5	do	180	2.00		2.00

EXCAVATION CLASS 4 (SOLID ROCK).

Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	Laterals:					
		Schedule 1	Cubic yard	80	$1.60		$1.60
		Schedule 2	do	50	1.50	$1.50	1.50
		Schedule 3	do	40	1.50		1.50
		Waste ditches:					
		Schedule 1	do	50	1.50		1.60
		Schedules 2 and 3	do	80	1.50		1.50
		Structures	do	10	1.00	1.25	Rejected.
Montana:							
St. Mary	July 31, 1906	Main canal	do	111,000	1.80		Rejected.
Sun River	Apr. 3, 1907	Canals and structures:					
		Division 1	do	500	1.00	3.00	3.00
		Division 2	do	200	1.00	1.25	1.25
		Division 3	do	100	1.00	1.20	1.20
		Division 4	do	500	1.00	1.00	1.00
		Division 5	do	100	.90	1.00	.90
Nebraska:							
North Platte	July 25, 1906	Interstate canal distribution system:					
		Schedule 1	do	100	.80	.90	.80
		Schedule 2	do	100	.65	.90	1.00
		Schedule 3	do	100	.65	.80	80
		Schedule 4	do	100	.60	.80	.60
		Schedules 5 and 9	do	200	.80	.90	1.00
		Schedule 6	do	100	.55	.60	.55
		Schedule 7	do	100	.90	1.00	.90
		Schedules 8 and 14	do	200	.90	1.00	1.25
		Schedules 10 and 11	do	200	.90	.90	.90
		Schedule 12	do	100	.90	1.00	1.00
		Schedule 13	do	100	.75	.90	.75
	Nov. 1, 1906	Structures	do	15,000	1.90		Rejected.
	Jan. 9, 1907	Diversion dam, schedule 2	do	7,000	2.20	2.50	3.00
	May 21, 1907	Laterals over 5-foot bottom width:					
		Schedule 1	do	7,000	.85	.85	.85
		Schedule 2	do	100	.65	.85	.90
		Schedule 3	do	700	.50	.75	1.00
		Schedule 4	do	300	.50	.75	.90
		Schedule 5	do	600	.50	.75	.90
		Laterals under 5-foot bottom width:					
		Schedule 1	do	100	.85	.85	.85
		Schedule 2	do	600	.65	.85	.90
		Schedule 3	do	100	.50	.75	1.00
		Schedules 4 and 5	do	350	.50	.75	.90
	June 20, 1907	Structures, schedule 1	do	300	5.00		5.00
New Mexico:							
Rio Grande	Oct. 16, 1906	Canal head works	do	600	2.00		2.00
		Canal	do	4,300	1.20		1.20
North Dakota:							
Buford-Trenton	Mar. 5, 1907	Canals and structures	do	25	2.50		2.50
Oregon:							
Klamath	Apr. 15, 1907	Keno canal, schedules 1-4	do	13,340	1.00		Rejected.

Unit prices on contract work—Continued.

EXCAVATION CLASS 4 (SOLID ROCK)—Continued.

State and project.	Date.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
					Lowest.	Next.	
South Dakota:							
Belle Fourche	Apr. 10, 1907	South canal:					
		Schedule 1, section 2	Cubic yard	300	$0.30		Rejected.
		Schedule 1, section 3	do	1,500	.39		Rejected.
		Schedule 1, section 4	do	2,000	.32		Rejected.
		Schedule 1, section 5	do	1,000	.32	$4.50	Rejected.
		Schedule 1, section 6	do	500	.29	1.00	Rejected.
		Schedule 1, sections 7 and 8	do	1,500	.29	1.00	$1.00
		Siphon and culvert, south canal:					
		Schedule 1, section 2	do	100	1.85		Rejected.
		Schedule 1, section 3	do	100	2.00		Rejected.
		Structures south canal, schedule 1, section 2	do	100	1.00		Rejected.
	Apr. 30, 1907	Laterals and structures:					
		Schedule 1, sections 1 and 2	do	350	1.50		Rejected.
		Schedule 1, section 3	do	200	1.00		1.00
		Schedule 1, section 4	do	200	No bid.	No bid.	
		Schedule 1, sections 5 and 6	do	400	.75	1.00	Rejected.
		Schedule 1, section 7	do	200	.75	1.25	.75
		Schedule 1, sections 8–11	do	1,150	1.25		1.25
	June 10, 1907	South canal:					
		Schedule 1, section 2	do	300	.29	1.00	Rejected.
		Schedule 1, section 3	do	1,500	.38	1.00	Rejected.
		Schedule 1, section 4	do	2,000	.50	.82	Rejected.
		Schedule 1, sections 5 and 6	do	1,500	.50	.82	1.00
		Siphon:					
		Schedule 1, section 2	do	100	1.50	2.10	Rejected.
		Schedule 1, section 3	do	100	1.50	2.00	Rejected.
		Structures, schedule 2	do	100	1.00	1.00	Rejected.
	July 11, 1906	Garland canal:					
		Division 1, schedules 1, 2, 4, and 6	do	81,000	1.25		Rejected.
		Division 1, schedules 3 and 5	do	600	1.25	1.50	Rejected.
		Division 1, schedule 7	do	81,700	1.05	1.15	1.15
	Aug. 23, 1906	Garland canal, structures:					
		Schedule 1	do	50	5.00		5.00
		Schedules 2, 3, 4, and 5	do	150	4.00		4.00
	Apr. 12, 1907	Garland canal:					
		Divisions 2 and 4	do	5,500	1.00		1.00
		Division 3	do	500	1.00	1.00	1.00
		Divisions 5–8	do	21,000	1.00	1.00	Rejected.
		Division 16	do	400	1.00	1.10	1.00
		Divisions 9–15, 17–19	do	4,700	1.00	1.10	1.00

LAYING PIPE.

South Dakota: Belle Fourche	June 10, 1907	24-inch culverts [a]	Linear foot	100	$1.50	$2.00	Rejected.
Wyoming: Shoshone	July 11, 1906	12-inch culverts [b]	do	100	.70	1.50	$1.50
		30-inch culverts [b]	do	1,060	1.50	2.00	2.00

LIFTING DEVICES.

Nebraska: North Platte	Jan. 24, 1907	Regulating gates [c]	Lifting device	9	$48.84	$71.40	$80.71
		Scouring gates [d]	do	4	65.94	98.90	102.52
	June 26, 1907	Sluice gates [e]	do	16	50.00	85.00	85.00
		Lateral head gates [e]	do	20	35.00	60.00	60.00
		Small wooden lateral head gates [f]	do	31	27.80	29.00	29.00

LUMBER.[g]

				Feet.			
Kansas: Garden City	July 10, 1906	For house	M Feet B. M		$58.00		Rejected.
Montana-North Dakota: Lower Yellowstone	Dec. 15, 1906	Structures, S. 1 S. & 1 E.	do	200,000	70.00	$75.00	Rejected.
		Structures, rough	do	100,000	68.00	70.00	Rejected.
Nebraska: North Platte	June 2, 1907	Structures	do	7,000	70.00		$70.00
North Dakota: Buford-Trenton	Mar. 5, 1907	Flume and turnouts	do	16,200	80.00		80.00
South Dakota: Belle Fourche	Apr. 10, 1907	Platforms and drains	do	20,000	70.00		80.00
		Platforms	do	20,000	70.00	70.00	Rejected.
North Dakota: Buford-Trenton	Mar. 5, 1907	Class 2	do	5,500	65.00		65.00
		Culverts	do	3,000	60.00		60.00
Wyoming: Shoshone	July 11, 1906	Bridge floor	do	500	50.00	50.00	50.00

[a] Laid with cement joints and back-filled.
[b] Laid with cement joints on gravel foundation and back-filled.
[c] Complete, including steel gate stem for lifting 10,000 pounds.
[d] Complete, including steel gate stem for lifting 20,000 pounds.
[e] Complete, including steel gate stem for lifting 2,500 pounds.
[f] Complete, including steel gate stem for lifting 500 pounds.
[g] Prices are for lumber in place.

Unit prices on contract work—Continued.

EXCAVATION CLASS 4 (SOLID ROCK)—Continued.

State and project.	Date.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
					Lowest.	Next.	
South Dakota:							
Belle Fourche	Apr. 10, 1907	South canal:					
		Schedule 1, section 2	Cubic yard	300	$0.30		Rejected.
		Schedule 1, section 3	do	1,500	.39		Rejected.
		Schedule 1, section 4	do	2,000	.32		Rejected.
		Schedule 1, section 5	do	1,000	.32	$4.50	Rejected.
		Schedule 1, section 6	do	500	.29	1.00	Rejected.
		Schedule 1, sections 7 and 8	do	1,500	.29	1.00	$1.00
		Siphon and culvert, south canal:					
		Schedule 1, section 2	do	100	1.85		Rejected.
		Schedule 1, section 3	do	100	2.00		Rejected.
		Structures south canal, schedule 1, section 2	do	100	1.00		Rejected.
	Apr. 30, 1907	Laterals and structures:					
		Schedule 1, sections 1 and 2	do	350	1.50		Rejected.
		Schedule 1, section 3	do	200	1.00		1.00
		Schedule 1, section 4	do	200	No bid.	No bid.	
		Schedule 1, sections 5 and 6	do	400	.75	1.00	Rejected.
		Schedule 1, section 7	do	200	.75	1.25	.75
		Schedule 1, sections 8–11	do	1,150	1.25		1.25
	June 10, 1907	South canal:					
		Schedule 1, section 2	do	300	.29	1.00	Rejected.
		Schedule 1, section 3	do	1,500	.38	1.00	Rejected.
		Schedule 1, section 4	do	2,000	.50	.82	Rejected.
		Schedule 1, sections 5 and 6	do	1,500	.50	.82	1.00
		Siphon:					
		Schedule 1, section 2	do	100	1.50	2.10	Rejected.
		Schedule 1, section 3	do	100	1.50	2.00	Rejected.
		Structures, schedule 2	do	100	1.00	1.00	Rejected.
Wyoming:							
Shoshone	July 11, 1906	Garland canal:					
		Division 1, schedules 1, 2, 4, and 6	do	81,000	1.25		Rejected.
		Division 1, schedules 3 and 5	do	600	1.25	1.50	Rejected.
		Division 1, schedule 7	do	81,700	1.05	1.15	1.15
	Aug. 23, 1906	Garland canal, structures:					
		Schedule 1	do	50	5.00		5.00
		Schedules 2, 3, 4, and 5	do	150	4.00		4.00
	Apr. 12, 1907	Garland canal:					
		Divisions 2 and 4	do	5,500	1.00		1.00
		Division 3	do	500	1.00	1.00	1.00
		Divisions 5–8	do	21,000	1.00	1.00	Rejected.
		Division 16	do	400	1.00	1.10	1.00
		Divisions 9–15, 17–19	do	4,700	1.00	1.10	1.00

EXCAVATION, CLASS 4 B (EXCAVATION BELOW PLANE OF SATURATION).

Kansas:							
Garden City	Sept. 28, 1906	Structures	Cubic yard	240	(a)		Rejected.
Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	do	do	100	$5.00	$6.00	Rejected.
Nebraska:							
North Platte	Jan. 9, 1907	Diversion dam	do	5,000	3.00	4.00	$3.00
New Mexico:							
Rio Grande	Oct. 16, 1906	Canal head works	do	9,000	.35		.35
		Canal	do	600	.25		.25
		Change of river channel	do	1,500	.20	.50	.20
South Dakota:							
Belle Fourche	Apr. 10, 1907	Siphon, South canal:					
		Schedule 1, sections 2 and 3	do	3,430	4.00		Rejected.
	June 10, 1907	Schedule 1, section 2	do	2,400	2.10	3.00	Rejected.
		Schedule 1, section 3	do	1,050	2.00	3.00	Rejected.
Wyoming:							
Shoshone	Oct. 6, 1906	Corbett dam	do	3,000	1.30	2.30	2.30

EXCAVATION, CLASS 4 B (SOLID ROCK UNDER WATER).

Nebraska:							
North Platte	Jan. 9, 1907	Diversion dam	Cubic yard	2,000	$4.50	$5.75	$4.50
Wyoming:							
Shoshone	Jan. 11, 1906	Corbett dam	do	1,500	4.65	4.90	4.65

GATES AND GUIDES.

Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	Sluice gates and frames	Pounds	100	$0.05	$0.07	Rejected.
Nebraska:							
North Platte	June 2, 1907	Handling, hauling, and setting	do	70,000	.025		$0.025
		Sluice gates, frames, etc	do	53,000	.080	.157	.080
		20 lateral head gates	do	17,000	.070	.080	.080
New Mexico:							
Rio Grande	Nov. 15, 1906	Gates, guides, and grating bars	do	4,500	.050	.055	.050

(a) Cost plus 15 per cent.

Unit prices on contract work—Continued.

GRAVEL (FOUNDATIONS AND RIPRAP).

State and project.	Date.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
					Lowest.	Next.	
Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	Riprap for canal	Cubic yard	200	$2.50	$3.00	Rejected.
Nebraska:							
North Platte	Jan. 9, 1907	....do	....do	6,600	2.50	3.00	$3.00
South Dakota							
Belle Fourche	Apr. 10, 1907	Foundations for concrete (screened)	....do	150	5.00	.....	Rejected.
	June 10, 1907	....do	....do	150	3.00	5.00	Rejected.
Wyoming:							
Shoshone	July 11, 1906	Foundations for concrete	....do	430	.90	1.00	.90
LATERALS TO CARRY 5 SECOND-FEET.							
North Dakota:							
Buford-Trenton	Mar. 5, 1907	Distributing system	Mile	9.0	$320.00	.....	$320.00
Wyoming:							
Shoshone	Mar. 12, 1907	Division 2	....do	3.5	352.00	.....	352.00
		Divisions 3 and 6-8	....do	15.0	300.00	$352.00	Rejected.
		Divisions 9-15 and 17-19	....do	46.4	300.00	352.00	300.00
		Division 16	....do	3.7	150.00	352.00	150.00
LATERALS TO CARRY 10 SECOND-FEET.							
North Dakota:							
Buford-Trenton	Mar. 5, 1907	Distributing system	Mile	1.0	$340.00	.....	$340.00
Wyoming:							
Shoshone	Mar. 12, 1907	Division 2	....do	1.9	880.00	.....	880.00
		Divisions 5-8	....do	6.5	300.00	$880.00	Rejected.
		Divisions 9-15 and 17-19	....do	25.3	300.00	880.00	300.00
		Division 16	....do	3.4	160.00	880.00	160.00
LATERALS TO CARRY 15 SECOND-FEET.							
Wyoming:							
Shoshone	Mar. 12, 1907	Divisions 5-7	Mile	2.0	$300.00	$1,368.00	Rejected.
		Divisions 9-15 and 17-19	....do	5.2	300.00	1,368.00	$300.00
		Division 16	....do	2.0	170.00	1,368.00	170.00

LAYING PIPE.

South Dakota:							
Belle Fourche	June 10, 1907	24-inch culverts [a]	Linear foot	100	$1.50	$2.00	Rejected.
Wyoming:							
Shoshone	July 11, 1906	12-inch culverts [b]	do	100	.70	1.50	$1.50
		30-inch culverts [b]	do	1,060	1.50	2.00	2.00

LIFTING DEVICES.

Nebraska:							
North Platte	Jan. 24, 1907	Regulating gates [c]	Lifting device	9	$48.84	$71.40	$80.71
		Scouring gates [d]	do	4	65.94	98.90	102.52
	June 26, 1907	Sluice gates [c]	do	16	50.00	85.00	85.00
		Lateral head gates [e]	do	20	35.00	60.00	60.00
		Small wooden lateral head gates [f]	do	31	27.80	29.00	29.00

LUMBER.[g]

				Feet.			
Kansas:							
Garden City	July 10, 1906	For house	M Feet B. M		$58.00		Rejected.
Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	Structures, S. 1 S. & 1 E	do	200,000	70.00	$75.00	Rejected.
		Structures, rough	do	100,000	68.00	70.00	Rejected.
Nebraska:							
North Platte	June 2, 1907	Structures	do	7,000	70.00		$70.00
North Dakota:							
Buford-Trenton	Mar. 5, 1907	Flume and turnouts	do	16,200	80.00		80.00
South Dakota:							
Belle Fourche	Apr. 10, 1907	Platforms and drains	do	20,000	70.00		80.00
		Platforms	do	20,000	70.00	70.00	Rejected.
North Dakota:							
Buford-Trenton	Mar. 5, 1907	Class 2	do	5,500	65.00		65.00
		Culverts	do	3,000	60.00		60.00
Wyoming:							
Shoshone	July 11, 1906	Bridge floor	do	500	50.00	50.00	50.00

[a] Laid with cement joints and back-filled.
[b] Laid with cement joints on gravel foundation and back-filled.
[c] Complete, including steel gate stem for lifting 10,000 pounds.
[d] Complete, including steel gate stem for lifting 20,000 pounds.
[e] Complete, including steel gate stem for lifting 2,500 pounds.
[f] Complete, including steel gate stem for lifting 500 pounds.
[g] Prices are for lumber in place.

Unit prices on contract work—Continued.

OVERHAUL.[a]

State and project.	Date.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
					Lowest.	Next.	
Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	Laterals and waste-water ditches:					
		Schedules 1 and 3	Cubic yard	41,000	$0.04		$0.04
		Schedule 2	do	39,600	.04	$0.04	.04
		Structures	do	1,000	.01	.02	Rejected.
Montana:							
Sun River	Apr. 3, 1907	Canals and structures:					
		Division 1	do	20,000	.02	.02	0.02
		Divisions 2 and 3	do	16,000	.02	.03	0.02
		Divisions 4 and 5	do	18,000	.02	.03	0.03
Nebraska:							
North Platte	July 25, 1906	Distribution system	do	18,000	.015	.015	0.015
North Dakota:							
Buford-Trenton	Mar. 5, 1907	Canals and structures	do	10,000	.035		.035
South Dakota:							
Bell Feourche	June 10, 1907	Price fixed	do	22,000	.02		.02
Wyoming:							
Shoshone	July 11, 1906	Garland canal:					
		Division 1, schedules 1-6	do	294	.015		Rejected.
		Division 1, schedule 7	do	248	.015		.015

PAVEMENT.[b]

Nebraska:							
North Platte	Jan. 9, 1907	Diversion dam headworks	Cubic yard	500	$7.50	$8.90	$9.00
	June 26, 1907	Structures, schedule 1	do	1,190	7.00		7.00
Wyoming:							
Shoshone	Mar. 18, 1907	Structures, Garland canal:					
		Schedules 2 and 3	do	650	5.00		5.00
		Schedule 4	do	50	5.50		5.50

PILES DELIVERED AND DRIVEN.[c]

New Mexico:							
Rio Grande	Oct. 16, 1906	Headworks	Linear foot	30,000	$0.48		$0.48
		Canal	do	450	.50		.50
		Change of river channel	do	5,000	.50	$0.75	.50

PILES, DRIVING ONLY.[d]

Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	Structures	Linear feet	500	$0.50	$0.60	Rejected.
North Dakota:							
Buford-Trenton	Mar. 5, 1907	Canal and structures	do	800	.50		$0.50
		Pressure pipe	do	200	.30		.30
		Pumping station	do	450	.50		.50
Wyoming:							
Shoshone	Aug. 23, 1906	Garland canal structures, schedule 4	do	600	1.25		1.25

PILING, SHEET.

				Feet.			
Montana:							
Lower Yellowstone	Dec. 15, 1906	Structures[e]	M feet B. M	3,000	$60.00	$70.00	Rejected.
North Dakota:							
Buford-Trenton	Mar. 5, 1907	Canals and structures[e]	do	2,500	50.00		$50.00
		Pressure pipe[e]	do	1,500	30.00		30.00
		Pumping station[e]	do	2,000	50.00		50.00
New Mexico:							
Rio Grande	Oct. 16, 1906	Headworks[f]	do	170,000	88.50		88.50
Wyoming:							
Shoshone	Aug. 23, 1906	Garland canal structures, schedule 4	do	30,000	55.00		55.00

PLACING REINFORCING STEEL IN CONCRETE.

Montana:							
St. Marys	July 31, 1906	Canal lining 4 inches thick	Pound	300,000	$0.02625		Rejected.
Wyoming:							
Shoshone	July 10, 1906	Corbett tunnel	do	250,000	.015	$0.03	$0.015
	Aug. 23, 1906	Structures, Garland canal:					
		Schedules 1, 2, and 4	do	47,000	.035		.035
		Schedule 3	do	80,000	.03		.03
		Schedule 5	do	400	.05		.05

[a] Prices are per cubic yard per 100 feet of haul beyond limit of free haul.
[b] Constructed on a gravel foundation, interstices between paving stones filled with screened gravel. Stones have a minimum thickness of 9 inches and are grouted. Cement is furnished by the United States.
[c] Bids are based on piles 25 feet long, having at least 8 inches diameter at the small end.
[d] Bids are based on actual penetration.
[e] Sheet piles are composed of three 2-inch by 12-inch planks, the inner ones of which are dressed to a uniform thickness and all of which are held together by clinched wire nails.
[f] Sheet piles are similar to those under [a], except the middle planks are not dressed.

Unit prices on contract work—Continued.

PLACING STRUCTURAL STEEL.

State and project.	Date.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
					Lowest.	Next.	
Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	Structures (placing gates)	Pound	6,000	$0.03	$0.04	Rejected.
New Mexico:							
Rio Grande	Oct. 16, 1906	Headworks	do	24,000	.05		$0.05
South Dakota:							
Belle Fourche	Apr. 10, 1907	South Canal:					
	June 10, 1907	Schedules 1 and 2	do	355,000	.015		Rejected.
		Do	do	355,000	.015	.015	Rejected.
Wyoming:							
Shoshone	July 11, 1906	Garland canal, division 1	do	18,000	.03	.04	.04
	July 10, 1906	Corbett dam	do	40,000	.03	.03	.03
	Aug. 23, 1906	Garland canal, structures	do	48,000	.04		.04

PRESERVING LUMBER.[a]

North Dakota:				*Feet.*			
Buford-Trenton	Mar. 5, 1907	Preservative furnished by United States	M feet B. M	5,000	$15.00		$15.00
		Do	do	1,500	15.00		15.00
		Do	do	2,000	15.00		15.00

PUDDLING.

Kansas:							
Garden City	Sept. 28, 1906	Structures[a]	Cubic yard	100	$0.25		Rejected.
Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	Lateral structures:					
		Schedule 1	do	450	1.00		$1.00
Montana:							
St. Mary	do	Schedule 2	do	890	.60		1.25
Sun River		Schedule 3	do	560	.60		.60
		Structures	do	3,000	.90	$1.75	Rejected.
North Dakota:	July 31, 1906	Main canal	do	1,300	.45		Rejected.
Lower Yellowstone	Apr. 3, 1907	Canals and structures:					
		Division 1	do	1,500	1.00	2.75	1.00
		Division 2	do	500	1.50	3.00	1.50

		Division 3	do	200	.90	2.50	2.50
		Division 4	do	500	.85	2.50	3.05
		Division 5	do	200	.50	2.50	.50
Nebraska:							
North Platte	June 26, 1907	Structures:					
		Schedules 1 and 2	do	8,000	.50		.50
		Schedules 1 and 2[c]	do	170	.75		.75
South Dakota:							
Belle Fourche	Apr. 10, 1907	Structures	do	500	2.00		Rejected.
	June 10, 1907	do	do	500	1.00	1.50	Rejected.
Wyoming:							
Shoshone	July 10, 1906	Corbett dam	do	3,000	.05	.30	.30
	Aug. 23, 1906	Structures, Garland canal:					
		Schedule 1	do	200	1.00		1.00
		Schedule 2	do	100	1.25		1.25
		Schedule 3	do	500	.75		.75
		Schedule 4	do	200	1.35		1.35

RIPRAP.

Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	Structures (grouted)[d]	Cubic yard	1,200	$5.00	$5.50	Rejected.
		Structures (not grouted)[d]	do	1,000	4.50	4.75	Rejected.
St. Mary	July 31, 1906	Main canal[d]	do	300	3.00		Rejected.
Nebraska:							
North Platte	June 26, 1907	Structures	do	200	5.00		$5.00
	Jan. 9, 1907	Diversion dam and headworks	do	4,500	3.99	4.50	4.50
New Mexico:							
Rio Grande	Oct. 16, 1906	Headworks[d]	do	70	1.00		1.00
North Dakota:							
Buford-Trenton	Mar. 5, 1907	Pressure pipe[d]	do	10	3.50		3.50
		Canals and structures[d]	do	80	4.00		4.00
Wyoming:							
Shoshone	July 11, 1906	Garland canal:					
		Division 1, schedule 1	do	100	3.50		Rejected.
		Division 1, schedule 2	do	40	3.50		Rejected.
		Division 1, schedule 3	do	140	3.50	4.00	Rejected.
		Division 1, schedule 4	do	50	3.50		Rejected.
		Division 1, schedule 5	do	10	3.50	4.00	Rejected.
		Division 1, schedule 6	do	1,200	3.50		Rejected.
		Division 1, schedule 7	do	1,540	2.50	3.00	3.00
	Feb. 27, 1907	Pathfinder dike[d]	do	16,000	4.75	5.00	Rejected.

[a] Preserving process consists of dipping in a bath of liquid.
[b] Pump houses, well pits, penstocks, etc.
[c] Loam and gravel or clay, sand and gravel thoroughly mixed.
[d] Hand-placed riprap.

Unit prices on contract work—Continued.

ROCK FILL.

State and project.	Date.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
					Lowest.	Next.	
New Mexico:							
Rio Grande	Oct. 16, 1906	Headworks	Cubic yard	4,000	$1.00		$1.00

STEEL FOR REINFORCEMENT.

Montana:							
Huntley	Apr. 24, 1907	Size ¼ inch, deformed	Pound	32,880	$0.0227	$0.0235	$0.0227
		Size ⅜ inch, deformed	do	350,374	.0217	.022	.0217
		Size ½ inch, deformed	do	413,100	.019	.0202	.0202
		Size ⅝ inch, deformed	do	95,500	.019	.0192	.0192
		Size 1 inch, deformed	do	28,220	.019	.019	.0192
		Size 1¼ inches, deformed	do	2,283	.0175	.019	.0192
		Size ½ inch, round	do	5,500	.015	.0175	.0222
Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1905	Size ½ inch, square	do	17,000	.074	.08	Rejected.
		Size ⅝ inch, square	do	72,000	.075	.075	Rejected.
Nebraska:							
North Platte	Jan. 24, 1907	Size ¼ inch, square	do	779	.0331	.040	.0331
		Size ⅜ inch, square	do	23,139	.0320	.040	.0320
		Size ½ inch, square	do	14,224	.0314	.040	.0314
		Size ⅝ inches, square	do	6,516	.0483	.040	.0483
		Size 1¼ inches, square	do	30,605	.0336	.039	.0336
		Size 1½ inches, square	do	50,163	.0314	.039	.0314
	June 26, 1907	¾–1¼ inch, square bars	do	275,000	.0193	.0175	.0193
		Size wire fabric	do	13,000	.0641	a .02½	0641
New Mexico:							
Rio Grande	Nov. 15, 1906	Size ⅜ inch, square	do	55,000	.018	.0185	.028
South Dakota:							
Belle Fourche	Apr. 30, 1907	Size ⅜ inch, square, twisted	do	1,250	.024		.024
		Size ½ inch, square, twisted	do	9,610	.021		.021
		Size ⅝ inch, square, twisted	do	7,300	.02		.02
		Size ¾ inch, square, twisted	do	7,520	.019		.019
		Size ½ inch, welded hoops, square, twisted	do	18,000	.045		.045
		Size ⅝ inch, welded hoops, square, twisted	do	298,200	.042		.042
Washington:							
Tieton	Dec. 26, 1906	Size ¼-inch, square	do	206,700	.0215	.0215	.02275
		Size ⅜-inch, square	do	1,542,000	.02125	.0215	.02125
		Size ½-inch, square	do	2,030	.01975	.02	.01975
		Size ⅝-inch, square	do	6,300	.01925	.02	.01925
		Size ¾-inch, square	do	18,230	.01925	.02	.01925

		Size ⅝-inch, square	do	17,500	.01875	.02	.01875
		Size ½-inch, square	do	300	.01875	.02	.01875
Wyoming:							
Shoshone	July 11, 1906	Wire fabric	do	2,440	.10	.10	.10
		Size ⅝-inch and ¾-inch, square	do	22,416	.05	.06	.06
	July 24, 1906	Size ⅝-inch, square or deformed	do	5,000	[b].0160	[b].0169	[c].0195
		Size ¾-inch, square or deformed	do	87,000	[b].0145	[b].0154	[c].0180
		Size ⅞-inch, square or deformed	do	13,000	[b].0140	[b].0150	[c].0175
		Size 1-inch, square or deformed	do	139,000	[b].0140	[b].0149	.....
		Size 1¼-inch, square or deformed	do	121,000	[b].0135	[b].0144	[c].0170
		Size 1½-inch, square or deformed	do	12,000	[b].0135	[b].0144	.....
		Size 1¾-inch, square or deformed	do	28,000	[b].0135	[b].0144	[c].0170

STRUCTURAL STEEL.

Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	I-beams and bolts	Pound	200	$0.08	$0.10	Rejected.
Nebraska:							
North Platte	Jan. 24, 1907	Channels, angles, and plates	do	13,007	.04	.0443	$0.04
	June 2, 1907	Bolts, forging, etc	do	3,000	.10	.....	.10
		Bolts, nuts, and washers	do	350	.10	.....	.10
New Mexico:							
Rio Grande	Nov. 15, 1906	I-beams, channels, angles, etc	do	12,800	.0374	.05	.05
North Dakota:							
Buford-Trenton	Mar. 5, 1907	Channels	do	4,750	.085	.....	.085
		I-beams, plates, and angles	do	5,400	.085	.....	.085
South Dakota:							
Belle Fourche	Apr. 30, 1907	4-inch I-beams	do	200	.0323	.....	.0323
		4-inch channels	do	1,200	.0323	.....	.0323
		8½-foot screens	Screen	16	10.75	.....	10.75
		10½-foot screens	do	8	12.85	.....	12.85

TUNNEL.

South Dakota:							
Belle Fourche	Apr. 10, 1907	Canal tunnel[d]	Cubic yard	6,000	$8.00	.....	Rejected.
		Drainage	Linear foot	400	.50	.....	Rejected.
		Timbering	M feet B. M	100,000	75.00	.....	Rejected.
	June 10, 1907	Canal tunnel	Cubic yard	6,000	7.00	$7.00	Rejected.
		Drainage	Linear foot	400	.50	.50	Rejected.
		Timbering	M feet B. M	100,000	75.00	75.00	Rejected.

[a] Unit price per square foot. [b] Plain square bars. [c] Square corrugated bars. [d] Section of tunnel 8 by 8 feet; lining to be paid for additionally.

NOTE.—All steel is of good quality of "medium."

Unit prices on contract work—Continued.

OVERHAUL.[a]

State and project.	Date.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
					Lowest.	Next.	
Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	Laterals and waste-water ditches:					
		Schedules 1 and 3	Cubic yard	41,000	$0.04		$0.04
		Schedule 2	do	39,600	.04	$0.04	.04
		Structures	do	1,000	.01	.02	Rejected.
Montana:							
Sun River	Apr. 3, 1907	Canals and structures:					
		Division 1	do	20,000	.02	.02	0.02
		Divisions 2 and 3	do	16,000	.02	.03	0.02
		Divisions 4 and 5	do	18,000	.02	.03	0.03
Nebraska:							
North Platte	July 25, 1906	Distribution system	do	18,000	.015	.015	0.015
North Dakota:							
Buford-Trenton	Mar. 5, 1907	Canals and structures	do	10,000	.035		.035
South Dakota:							
Bell Feourche	June 10, 1907	Price fixed	do	22,000	.02		.02
Wyoming:							
Shoshone	July 11, 1906	Garland canal:					
		Division 1, schedules 1–6	do	294	.015		Rejected.
		Division 1, schedule 7	do	248	.015		.015

PAVEMENT.[b]

Nebraska:							
North Platte	Jan. 9, 1907	Diversion dam headworks	Cubic yard	500	$7.50	$8.90	$9.00
	June 26, 1907	Structures, schedule 1	do	1,190	7.00		7.00
Wyoming:							
Shoshone	Mar. 18, 1907	Structures, Garland canal:					
		Schedules 2 and 3	do	650	5.00		5.00
		Schedule 4	do	50	5.50		5.50

PILES DELIVERED AND DRIVEN.[c]

New Mexico:							
Rio Grande	Oct. 16, 1906	Headworks	Linear foot	30,000	$0.48		$0.48
		Canal	do	450	.50		.50
		Change of river channel	do	5,000	.50	$0.75	.50

PILES, DRIVING ONLY.[d]

Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	Structures	Linear feet	500	$0.50	$0.60	Rejected.
North Dakota:							
Buford-Trenton	Mar. 5, 1907	Canal and structures	do	800	.50		$0.50
		Pressure pipe	do	200	.30		.30
		Pumping station	do	450	.50		.50
Wyoming:							
Shoshone	Aug. 23, 1906	Garland canal structures, schedule 4	do	600	1.25		1.25

PILING, SHEET.

				Feet.			
Montana:							
Lower Yellowstone	Dec. 15, 1906	Structures[e]	M feet B. M	3,000	$60.00	$70.00	Rejected.
North Dakota:							
Buford-Trenton	Mar. 5, 1907	Canals and structures[e]	do	2,500	50.00		$50.00
		Pressure pipe[e]	do	1,500	30.00		30.00
		Pumping station[e]	do	2,000	50.00		50.00
New Mexico:							
Rio Grande	Oct. 16, 1906	Headworks[f]	do	170,000	88.50		88.50
Wyoming:							
Shoshone	Aug. 23, 1906	Garland canal structures, schedule 4	do	30,000	55.00		55.00

PLACING REINFORCING STEEL IN CONCRETE.

Montana:							
St. Marys	July 31, 1906	Canal lining 4 inches thick	Pound	300,000	$0.02625		Rejected.
Wyoming:							
Shoshone	July 10, 1906	Corbett tunnel	do	250,000	.015	$0.03	$0.015
	Aug. 23, 1906	Structures, Garland canal:					
		Schedules 1, 2, and 4	do	47,000	.035		.035
		Schedule 3	do	80,000	.03		.03
		Schedule 5	do	400	.05		.05

[a] Prices are per cubic yard per 100 feet of haul beyond limit of free haul.
[b] Constructed on a gravel foundation, interstices between paving stones filled with screened gravel. Stones have a minimum thickness of 9 inches and are grouted. Cement is furnished by the United States.
[c] Bids are based on piles 25 feet long, having at least 8 inches diameter at the small end.
[d] Bids are based on actual penetration.
[e] Sheet piles are composed of three 2-inch by 12-inch planks, the inner ones of which are dressed to a uniform thickness and all of which are held together by clinched wire nails.
[f] Sheet piles are similar to those under [a], except the middle planks are not dressed.

Unit prices on contract work—Continued.

PLACING STRUCTURAL STEEL.

State and project.	Date.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
					Lowest.	Next.	
Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	Structures (placing gates)	Pound	6,000	$0.03	$0.04	Rejected.
New Mexico:							
Rio Grande	Oct. 16, 1906	Headworks	do	24,000	.05		$0.05
South Dakota:							
Belle Fourche	Apr. 10, 1907	South Canal:					
	June 10, 1907	Schedules 1 and 2	do	355,000	.015		Rejected.
		Do	do	355,000	.015	.015	Rejected.
Wyoming:							
Shoshone	July 11, 1906	Garland canal, division 1	do	18,000	.03	.04	.04
	July 10, 1906	Corbett dam	do	40,000	.03	.03	.03
	Aug. 23, 1906	Garland canal, structures	do	48,000	.04		.04

PRESERVING LUMBER.[a]

North Dakota:				*Feet.*			
Buford-Trenton	Mar. 5, 1907	Preservative furnished by United States	M feet B. M	5,000	$15.00		$15.00
		Do	do	1,500	15.00		15.00
		Do	do	2,000	15.00		15.00

PUDDLING.

Kansas:							
Garden City	Sept. 28, 1906	Structures[a]	Cubic yard	100	$0.25		Rejected.
Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	Lateral structures:					
		Schedule 1	do	450	1.00		$1.00
Montana:							
St. Mary	do	Schedule 2	do	890	.60		1.25
Sun River		Schedule 3	do	560	.60		.60
		Structures	do	3,000	.90	$1.75	Rejected.
North Dakota:	July 31, 1906	Main canal	do	1,300	.45		Rejected.
Lower Yellowstone	Apr. 3, 1907	Canals and structures:					
		Division 1	do	1,500	1.00	2.75	1.00
		Division 2	do	500	1.50	3.00	1.50

		Division 3	do	200	.90	2.50	2.50
		Division 4	do	500	.85	2.50	3.00
		Division 5	do	200	.50	2.50	.50
Nebraska:							
North Platte	June 26, 1907	Structures:					
		Schedules 1 and 2	do	8,000	.50		.50
		Schedules 1 and 2[c]	do	170	.75		.75
South Dakota:							
Belle Fourche	Apr. 10, 1907	Structures	do	500	2.00		Rejected.
	June 10, 1907	do	do	500	1.00	1.50	Rejected.
Wyoming:							
Shoshone	July 10, 1906	Corbett dam	do	3,000	.05	.30	.30
	Aug. 23, 1906	Structures, Garland canal:					
		Schedule 1	do	200	1.00		1.00
		Schedule 2	do	100	1.25		1.25
		Schedule 3	do	500	.75		.75
		Schedule 4	do	200	1.35		1.35

RIPRAP.

Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	Structures (grouted)[d]	Cubic yard	1,200	$5.00	$5.50	Rejected.
		Structures (not grouted)[d]	do	1,000	4.50	4.75	Rejected.
St. Mary	July 31, 1906	Main canal[d]	do	300	3.00		Rejected.
Nebraska:							
North Platte	June 26, 1907	Structures	do	200	5.00		$5.00
	Jan. 9, 1907	Diversion dam and headworks	do	4,500	3.99	4.50	4.50
New Mexico:							
Rio Grande	Oct. 16, 1906	Headworks[d]	do	70	1.00		1.00
North Dakota:							
Buford-Trenton	Mar. 5, 1907	Pressure pipe[d]	do	10	3.50		3.50
		Canals and structures[d]	do	80	4.00		4.00
Wyoming:							
Shoshone	July 11, 1906	Garland canal:					
		Division 1, schedule 1	do	100	3.50		Rejected.
		Division 1, schedule 2	do	40	3.50		Rejected.
		Division 1, schedule 3	do	140	3.50	4.00	Rejected.
		Division 1, schedule 4	do	50	3.50		Rejected.
		Division 1, schedule 5	do	10	3.50	4.00	Rejected.
		Division 1, schedule 6	do	1,200	3.50		Rejected.
		Division 1, schedule 7	do	1,540	2.50	3.00	3.00
	Feb. 27, 1907	Pathfinder dike[d]	do	16,000	4.75	5.00	Rejected.

[a] Preserving process consists of dipping in a bath of liquid.
[b] Pump houses, well pits, penstocks, etc.
[c] Loam and gravel or clay, sand and gravel thoroughly mixed.
[d] Hand-placed riprap.

Unit prices on contract work—Continued.

ROCK FILL.

State and project.	Date.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
					Lowest.	Next.	
New Mexico: Rio Grande	Oct. 16, 1906	Headworks	Cubic yard	4,000	$1.00		$1.00

STEEL FOR REINFORCEMENT.

Montana: Huntley	Apr. 24, 1907	Size ¼ inch, deformed	Pound	32,880	$0.0227	$0.0235	$0.0227
		Size ⅜ inch, deformed	do	350,374	.0217	.022	.0217
		Size ½ inch, deformed	do	413,100	.019	.0202	.0202
		Size ⅝ inch, deformed	do	95,500	.019	.0192	.0192
		Size 1 inch, deformed	do	28,220	.019	.019	.0192
		Size 1¼ inches, deformed	do	2,283	.0175	.019	.0192
		Size ½ inch, round	do	5,500	.015	.0175	.0222
Montana-North Dakota: Lower Yellowstone	Dec. 15, 1905	Size ½ inch, square	do	17,000	.074	.08	Rejected.
		Size ⅝ inch, square	do	72,000	.075	.075	Rejected.
Nebraska: North Platte	Jan. 24, 1907	Size ¼ inch, square	do	779	.0331	.040	.0331
		Size ½ inch, square	do	23,139	.0320	.040	.0320
		Size 1 inch, square	do	14,224	.0314	.040	.0314
		Size 1¼ inches, square	do	6,516	.0483	.040	.0483
		Size 1½ inches, square	do	30,605	.0336	.039	.0336
		Size 1¾ inches, square	do	50,163	.0314	.039	.0314
	June 26, 1907	¾–1½ inch, square bars	do	275,000	.0193	.0175	.0193
		Size wire fabric	do	13,000	.0641	a .02¼	.0641
New Mexico: Rio Grande	Nov. 15, 1906	Size ⅝ inch, square	do	55,000	.018	.0185	.028
South Dakota: Belle Fourche	Apr. 30, 1907	Size ¾ inch, square, twisted	do	1,250	.024		.024
		Size ½ inch, square, twisted	do	9,610	.021		.021
		Size ⅝ inch, square, twisted	do	7,300	.02		.02
		Size ¾ inch, square, twisted	do	7,520	.019		.019
		Size ¼ inch, welded hoops, square, twisted	do	18,000	.045		.045
		Size ⅝ inch, welded hoops, square, twisted	do	298,200	.042		.042
Washington: Tieton	Dec. 26, 1906	Size ¼-inch, square	do	206,700	.0215	.0215	.02275
		Size ⅜-inch, square	do	1,542,000	.02125	.0215	.02125
		Size ½-inch, square	do	2,030	.01975	.02	.01975
		Size ⅝-inch, square	do	6,300	.01925	.02	.01925
		Size ¾-inch, square	do	18,230	.01925	.02	.01925

		Size ½-inch, square	do	17,500	.01875	.02	.01875
		Size ⅜-inch, square	do	300	.01875	.02	.01875
Wyoming:							
Shoshone	July 11, 1906	Wire fabric	do	2,440	.10	.10	.10
		Size ¼-inch and ¾-inch, square	do	22,416	.05	.06	.06
	July 24, 1906	Size ½-inch, square or deformed	do	5,000	[b].0160	[b].0169	[c].0195
		Size ⅝-inch, square or deformed	do	87,000	[b].0145	[b].0154	[c].0180
		Size ¾-inch, square or deformed	do	13,000	[b].0140	[b].0150	[c].0175
		Size ⅞-inch, square or deformed	do	139,000	[b].0140	[b].0149	
		Size 1-inch, square or deformed	do	121,000	[b].0135	[b].0144	[c].0170
		Size 1⅛-inch, square or deformed	do	12,000	[b].0135	[b].0144	
		Size 1¼-inch, square or deformed	do	28,000	[b].0135	[b].0144	[c].0170

STRUCTURAL STEEL.

Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	I-beams and bolts	Pound	200	$0.08	$0.10	Rejected.
Nebraska:							
North Platte	Jan. 24, 1907	Channels, angles, and plates	do	13,007	.04	.0443	$0.04
	June 2, 1907	Bolts, forging, etc	do	3,000	.10		.10
		Bolts, nuts, and washers	do	350	.10		.10
New Mexico:							
Rio Grande	Nov. 15, 1906	I-beams, channels, angles, etc	do	12,800	.0374	.05	.05
North Dakota:							
Buford-Trenton	Mar. 5, 1907	Channels	do	4,750	.085		.085
		I-beams, plates, and angles	do	5,400	.085		.085
South Dakota:							
Belle Fourche	Apr. 30, 1907	4-inch I-beams	do	200	.0323		.0323
		4-inch channels	do	1,200	.0323		.0323
		8½-foot screens	Screen	16	10.75		10.75
		10½-foot screens	do	8	12.85		12.85

TUNNEL.

South Dakota:							
Belle Fourche	Apr. 10, 1907	Canal tunnel [d]	Cubic yard	6,660	$3.00		Rejected.
		Drainage	Linear foot	400	.50		Rejected.
		Timbering	M feet B. M	100,000	75.00		Rejected.
	June 10, 1907	Canal tunnel	Cubic yard	6,000	7.00	$7.00	Rejected.
		Drainage	Linear foot	400	.50	.50	Rejected.
		Timbering	M feet B. M	100,000	75.00	75.00	Rejected.

[a] Unit price per square foot. [b] Plain square bars. [c] Square corrugated bars. [d] Section of tunnel 8 by 8 feet; lining to be paid for additionally.

NOTE.—All steel is of good quality of "medium."

Unit prices on contract work—Continued.

VITRIFIED PIPE.

State and project.	Date.	Feature or description.	Unit.	Quantity.	Bids per unit.		Contract price.
					Lowest.	Next.	
Montana-North Dakota:							
Lower Yellowstone	Dec. 15, 1906	12-inch, double strength	Linear foot	150	$3.00	$4.00	Rejected.
		18-inch, double strength	do	50	5.00	5.00	Rejected.
		24-inch, double strength	do	100	6.00	6.00	Rejected.
North Dakota:							
Buford-Trenton	Mar. 5, 1907	12-inch, double strength [a]	do	100	2.25	.....	$2.25
		15-inch, double strength [a]	do	100	2.75	.....	2.75
		18-inch, double strength [a]	do	200	3.40	.....	3.40
South Dakota:							
Belle Fourche	Apr. 10, 1907	Laying 24-inch	do	100	2.00	.....	Rejected.
	June 10, 1907	do	do	100	1.50	2.00	Rejected.
		12-inch single strength [b]	do	2,000	0.18¾	0.18¾	0.18¾
		18-inch single strength [b]	do	700	0.45	0.45	0.45
		18-inch double strength [b]	do	3,800	0.52½	0.52½	0.52½
		21-inch single strength [b]	do	1,350	0.70	0.70	0.70
		21-inch double strength [b]	do	1,450	0.90	0.90	0.90
		24-inch double strength [b]	do	1,600	1.12½	1.12½	1.12½
		30-inch double strength [b]	do	60	1.60	1.62½	1.62½
		18-inch Y branch, 12-inch hole [b]	Branch	3	2.10	2.36¼	2.36¼
		21-inch Y branch, 12-inch hole [b]	do	3	3.60	4.05	4.05
Wyoming:							
North Platte	Feb. 27, 1907	8-inch, single strength [c]	Linear foot	1,100	.63	1.00	Rejected.
		8-inch, single strength [d]	do	180	.68	1.50	Rejected.

WELLS.

Kansas:							
Garden City	Sept. 28, 1906	0–50 feet, 12 inches inside diameter	Linear foot	1,100	$5.50	$8.50	Rejected.
		50–100 feet, 12 inches inside diameter	do	1,100	5.00	8.50	Rejected.
		100–150 feet, 12 inches inside diameter	do	1,100	4.50	8.50	Rejected.
		150–200 feet, 12 inches inside diameter	do	1,100	4.00	8.50	Rejected.
		200–250 feet, 12 inches inside diameter	do	1,100	3.50	8.50	Rejected.
		250–300 feet, 12 inches inside diameter	do	1,100	3.00	8.50	Rejected.
		Shallow, 15 inches inside diameter	do	9,250	3.95	5.00	Rejected.

[a] Laid in trenches with 4-foot cut or less.
[b] Prices are for material f. o. b. cars at Kansas City, Mo., subject to inspection at destination.
[c] Laid with dry joints.
[d] Laid with cement joints.

NOTE.—Pipes in general laid in shallow trenches and with cement joints, cement being furnished by the United States.

ARIZONA.

SALT RIVER PROJECT.

GENERAL STATEMENT.

The principal data relating to the Salt River project are summarized below:

Summary of principal data relating to Salt River project.

Counties: Maricopa, Gila.
Latitude: 33° 30′.
Longitude: 112°.
Average rainfall: On drainage basin, 10 to 20 inches; on irrigable area, 8 to 10 inches.
Estimated annual discharge of Salt River at dam site: 700,000 acre-feet.
Range of temperature: Maximum, 120°; minimum, 20°; mean, 70°.
Average elevation of irrigated lands: 1,000 to 1,300 feet.
Principal products: Semitropical fruits, cereals, alfalfa.
Principal railroads: Gila Valley, Globe and Northern; Santa Fe, Prescott and Phoenix; Maricopa, Phoenix and Salt River Valley.
Nearest station: Globe, 43 miles from dam; Phoenix, 78 miles from dam, in center of irrigable district.
Principal markets: Phoenix and other Arizona towns, Pacific coast cities, and eastern fruit markets.
Irrigable area: 210,000 acres.
Watershed area: 6,260 square miles above the mouth of Verde River.
Reservoir area: 25.5 square miles.
Capacity of reservoir: 1,284,000 acre-feet at elevation 220 feet above low water.
Duty of water: 4 acre-feet per year.
Height of dam: 284 feet.
Length of dam: 235 feet at river, 1,080 feet at top, including spillways.
Type of dam: Masonry arch; gravity section from foundation; radius, 400 feet.
Power developed: 4,400 horsepower from power canal; 3,000 from reservoir (at dam site); penstock tunnel, 620 feet.
Length of tunnels: 9,780 feet.
Ownership of lands: Mainly private.
Character of soil: Sandy loam, with clay in places.
Value of irrigated land: $50 to $500 per acre, depending upon location.

The construction of this project was authorized March 14, 1903. The project contemplates the irrigation of about 210,000 acres of fertile land in the Salt River Valley near Phoenix. This land lies on both sides of the river and slopes gently to the southwest. There is a large district near Mesa and Tempe where the underground water is so near the surface as to be readily reached by pumping, and the installation of enough pumping plants to irrigate from 25,000 to 40,000 acres of land in addition to the area served by the reservoir will soon be under way.

When finally completed the irrigation works will consist of the Roosevelt dam, impounding 1,300,000 acre-feet of water; a large

diversion dam at Granite Reef, about 30 miles above Phoenix, to divert the combined waters of Salt and Verde rivers into the canal systems of the valley; pumping plants, for which power will be generated at the Roosevelt dam and at various points along the canals and Salt River, and a complete system of main and distributing canals and laterals. Some of these works are already finished and in operation.

On account of the great distance of the Roosevelt dam from the railroad and centers of population, it was necessary to do considerable preliminary work in order to enable operations to be carried on properly. In order to afford proper means of transporting materials and supplies, it was necessary to build a wagon road from Roosevelt to Mesa and from Roosevelt to Tonto and a logging road from Roosevelt to the sawmill. It was also necessary to erect proper office buildings and cottages for the engineering force, warehouses for the supplies and equipment, and corrals and stables for the animals. A system for providing a water supply has been installed and a refrigerating plant has been erected. Other structures that have been necessary for the proper prosecution of the work include a telephone line, sawmill, cement mill, sand-crushing plant, machine and blacksmith shops, and a power plant, comprising canal, dam, electric machinery, and penstock tunnel. The greater part of these structures were built prior to the period covered by this report and are described in previous annual reports. Additional details concerning those on which work has been carried on during the last year are given below.

In the following table are listed the contracts entered into for building work on the Salt River project. This list includes all contracts for excavation, embankment, masonry, and erection of structures, but does not include materials such as cement, steel, timber, etc.:

Contracts for building work on Salt River project to June 30, 1907.

No. of contract.	Contractor.	Feature.	Estimated total value.	Payments to June 30, 1906.	Per cent paid.
5	Wilcox & Rose	Cement mill	$12,088.00	$12,505.56	100
7	James R. Thorpe	Telephone	22,348.00	22,711.43	100
11	Robert Sherer & Co	Power canal, schedule 1	165,400.00	317,681.50	100
12	John Tuttle	Power canal, schedule 2	140,912.00	166,623.66	100
13	....do	Sluicing tunnel	12,000.00	11,178.00	100
35	J. M. O'Rourke & Co	Roosevelt dam	1,147,600.00	31,065.59	14

ROOSEVELT DAM.

On September 20, 1906, the first stone was laid in the Roosevelt dam. The placing of masonry continued without interruption until December 3, during which period 8,000 cubic yards were laid. On this date the river suddenly rose to a maximum of 60,000 second-feet, destroying a large portion of the cofferdam and injuring the contractors' equipment in the river bed. By December 10 the flood had subsided enough to allow repair work to be done and excavation was again under way, but on the 28th another flood of similar proportions occurred and all attempts to work in the river bed were

temporarily abandoned. Continued high water prevented any further excavation until June 5, 1907. The contractors again began laying masonry on June 18, continuing without interruption until July 23, when a small flood came down the river, covering their machinery and causing a delay of one week. At the end of July the south half of the upstream face of dam was at an elevation of 13 feet and the north half about 9 feet above zero.

OUTLET TUNNEL AND GATES.

The contractors for the dam have had the use of the sluicing tunnel since June 13, 1906, and as a consequence nothing has been done toward setting the hydraulic gates furnished under contract with the Llewellyn Iron Works. All material has, however, been delivered, and it is intended that the gates shall be put in place this fall.

POWER CANAL.

The power canal has been in constant use since its completion, with the exception of a few inconsequent delays, due to small breaks, none of these having occurred in the last several months. At the entrance to the penstock tunnel a revolving screen has been installed for the purpose of keeping the rack bars in front of the gates free from débris.

INTAKE DIVERSION DAM.

On October 29, 1906, the diversion dam at the intake of the power canal was completed to finished height, and the apron was finished during November. On November 2, and only a short time after all forms had been removed, a flood 8½ feet in height passed over the crest of this dam, but neither this nor subsequent floods have caused the slightest damage. The excavation for this dam consisted of 10,000 cubic yards sand, gravel, and bowlders, above water, and 6,400 cubic yards, below water. Nine thousand cubic yards of embankment were built, and 4,800 cubic yards of bowlder concrete were used in construction.

POWER PLANT.

The first unit of this plant, furnished by the S. Morgan Smith Company and the General Electric Company, has been installed and was operated for the first time on August 17. No efficiency test has as yet been made. The temporary plant has been in constant use since early in 1906. The building for the new plant is practically completed, with the exception of the roof. The walls of this building are of masonry and are concrete lined.

SAND-CRUSHING PLANT.

This plant was completed early in 1906, but was not operated until September, since when it has been in use at such times as the dam contractors were laying masonry. The effect of this plant has been to secure a better quality of sand at a lower price.

CEMENT PLANT.

For the year ending June 30, 1907, the cement mill was in operation about 5½ months, producing during this time 20,000 barrels of cement, running at half capacity. This delay in the manufacture of cement was due mainly to the fact that the contractors were not using cement in sufficient quantities to permit of continuous operation. Great difficulty has also been experienced in securing fuel oil on the C. R. Eager & Co. contract, and these delays have added materially to the cost during the year. The following figures show unit costs for the months of April and June, 1907:

Analysis of cost of manufacture of cement at Roosevelt, Ariz.

Items.	April.	June.
Office salaries	$0.09	$0.11
Labor operating	.28	.34
Labor maintenance	.05	.13
Material maintenance	.03	.06
Limestone	.11	.18
Clay digging	.02	.03
Clay hauling	.06	.08
Fuel, wood	.04	.04
Miscellaneous	.06	.01
Electric power	.15	.14
Fuel, oil	.91	.35
Total	1.80	1.97
Total manufactured.....barrels..	5,433	4,491

OPERATION OF CANAL SYSTEM.

On May 15, 1907, the United States undertook the operation of the canal system on the north side of the river. These canals were in bad shape and have since been greatly improved. The water service has been better during the present season than at any time during the last ten years, plenty of water being in the canals during the driest period. A temporary dam was built at the head of the Arizona canal and has been maintained in spite of the floods which have gone over it, so that at no time was there a shortage of water. The lay-out of a new system of canals and laterals is being studied, and it is the intention to irrigate the entire north side from two main canals—the Arizona, and one to take the place of the Salt, the Maricopa, and the Appropriators.

GRANITE REEF DAM.

The erection of Granite Reef dam by force account was authorized on July 26, 1906, but active work did not begin until October, when excavation for canal and headworks was put under way. Since that time operations have been pushed as rapidly as conditions would permit. A portion of the canal on the south side of the river, the regulating gates, canal gates, and end structures, together with about 50 feet of the main dam, have been completed. On the north side a large portion of the regulating gate structure, the sluice gates, and sluice walls have been completed, together with about 240 feet of the main dam; 54,000 cubic yards earth and rock have been excavated; 36,000 cubic yards fill made; 12,000 cubic yards concrete and 5,000 *square yards* paving laid.

TRANSMISSION LINE.

In order to utilize the power to be developed at the dam it was decided to build a transmission line from that point to the valley, where the power will be used for pumping water from wells to be sunk south of Mesa for irrigating purposes. A market for all surplus power will be found among the towns in the valley, and it is expected that the power sold will go far toward returning to the reclamation fund the cost of the Salt River project. Survey of this line was made during the spring of 1907, and active work on constructing same is now in progress. Contract for furnishing towers for the first section has been let to the U. S. Wind Engine and Pump Company, Batavia, Ill., and for tripartite poles for that portion of the line in the irrigated section to B. F. Kierulff, jr., & Co., Los Angeles, Cal. It is contemplated that work on sinking the wells south of Mesa to irrigate from 25,000 to 40,000 acres will begin this fall.

On June 3, 1907, a contract was entered into with the Salt River Valley Water Users' Association, providing for the irrigation of lands of the Pima Indians in connection with the Salt River project. The work of sinking these wells and constructing the necessary canals, as well as extending the transmission line to the boundaries of the reservation, will be under the direction of the Reclamation Service, and $300,000 of the amount appropriated for an irrigation system for the Pima Indians is to be turned over to the credit of the Salt River project.

IRRIGABLE LANDS.

The distribution of the lands under this project is shown in the following table:

Lands included in Salt River project.

	Cultivated.	Uncultivated.	Cultivated.	Uncultivated.
GENERAL SUMMARY.	*Acres.*	*Acres.*	*Per cent.*	*Per cent.*
North of river	73,145	94,120	26	35
South of river	51,947	53,604	19	19
Total	125,092	147,724	46	54
NORTH OF RIVER.				
Under Arizona canal	23,440	73,341	24	76
Under Grand canal	19,871	12,038	63	37
Under Maricopa canal	14,186	295	98	2
Under Salt canal	15,648	8,446	65	35
SOUTH OF RIVER.				
Under Highland canal	540	14,530	3	97
Under Consolidated canal	1,320	27,440	4	96
Under Mesa canal	13,657	3,095	81	19
Under Utah canal	9,600	958	91	9
Under Tempe canal	21,000	5,084	80	20
Under San Francisco canal	4,328	332	93	7
Under French, Lambeye, and other canals	1,502	2,165	40	60

EXPENDITURES.

The expenditures to June 30, 1906, are summarized in the following tables:

Expenditures according to physical features on Salt River project to June 30, 1907.

Features.	Engineering and administration.	Building.
Incidental structures:		
Road, Mesa to Roosevelt (62 miles)	$6,340.00	$304,031.04
Road, Mesa to Roosevelt, flood expense	.....	18,585.52
Road, Livingstone to sawmill (22 miles)	680.00	14,150.00
Road, Roosevelt to Tonto (12 miles)	3,338.40	56,811.38
Road, Desert Wells to Granite Reef (8 miles)	175.00	3,718.82
Road, Roosevelt to Globe (15 miles)	2,322.00	80,731.44
Road, miscellaneous (27½ miles)	465.00	11,163.93
Telephone line	981.00	48,123.07
Cement mill	3,241.00	218,839.61
Sawmill	.....	8,111.31
Sand-crushing plant	540.00	23,411.22
Machine and blacksmith shops	114.00	7,482.94
Steam-power plant and electric lighting	792.00	39,199.12
Waterworks	320.00	12,635.91
Suspension bridge	.....	809.80
Refrigerating plant	100.00	5,069.82
Headquarters buildings, offices, etc	1,000.00	23,703.22
Headquarters, cottages, boarding house	560.00	29,878.86
Headquarters warehouses, corrals, etc	128.00	2,953.20
Inventory, undistributed	.....	90,727.09
Irrigation structures:		
Roosevelt reservoir, lands submerged	.....	67,064.89
Roosevelt dam, Hudson reservoir site	.....	40,000.00
Roosevelt dam and spillway	24,458.17	234,791.81
Roosevelt dam, gates	4,523.00	139,302.82
Roosevelt dam, sluicing tunnel	940.00	45,083.90
Power diversion dam	3,962.00	94,620.19
Power canal and structures	41,713.01	1,066,885.16
Hydro-electric power plant	3,839.00	92,131.24
Transmission line	2,500.00	1,013.33
Granite Reef dam and structures	17,321.53	222,373.51
Arizona canal heading	750.00	17,993.35
Distributing canal system and structures	13,500.00	323,884.12
Irrigable lands:		
Farm units, etc	16,928.14	.....
Examination of the project as a whole	188,411.21	.....
Administration of the project as a whole	221,665.44	.....
Total	561,607.90	3,345,281.62
Grand total	.....	3,906,889.52

Total expenditures, according to purpose and nature, on Salt River project to June 30, 1907.

[Total, $3,906,889.52.]

	Services.	Traveling.	Subsistence.	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination	$30,204.34	$3,655.54	$5,751.65	$1,943.74	$2,712.37	$2,807.03	$135.30	$1,463.58	.....
Survey	61,808.40	6,958.09	7,869.11	17,306.20	3,400.00	6,763.34	522.51	5,401.17	.....
Design	37,859.80	1,579.31	3,670.70	4,246.92	3,420.50	5,153.21	297.93	977.60	$277.93
Subdivision	3,627.38	419.03	7.55	437.83	.....	536.72	91.35	1.80	.....
Building:									
Rights and property	6,417.04	702.60	767.55	705.69	502.58	401,346.49	.....	111.04	.....
Building	1,165,052.64	6,680.65	208,325.31	157,593.74	256,758.61	277,362.37	4,860.40	83,811.31	892,703.00
Maintenance	.....	.....	.....	37.50	46.90	57.67	.....	.....	.....
Operation	75.00	.....	.....	8.00	.....	.....	.....	.....	.....
Administration	141,636.46	19,002.07	7,229.87	18,386.80	5,534.92	23,966.81	3,294.42	2,614.09	.....

PROPOSED SAN PEDRO PROJECT.

The only work done on the San Pedro project during the last fiscal year was in connection with measurements of the flow of San Pedro River. The net expenditures on this project to June 30, 1907, were $2,423.37.

PROPOSED SAN CARLOS PROJECT.

The gauging stations have been maintained on this project, one on San Francisco River and one on Gila River, but no other work has been done during the last fiscal year. The net expenditures on this project to June 30, 1907, were $23,664.71.

PROPOSED LITTLE COLORADO PROJECT.

No work has been done on this project during the last fiscal year, except that necessary for measuring the flow of Little Colorado River. The net expenditures on this project to June 30, 1907, were $7,994.03.

CALIFORNIA.

ORLAND PROJECT.

The principal facts relating to the Orland project are summarized below:

Summary of principal data relating to the Orland project.

State: California.
Counties: Glenn and Tehama.
Townships: 21 to 23 north, ranges 2 to 4 west, Mount Diablo meridian.
Latitude: 39° 45′.
Longitude: 122° 15′.
Altitude: 175 to 380 feet.
Railway connections: Southern Pacific.
Principal markets: San Francisco and Sacramento, Cal.
Character of soil: Gravelly loam.
Range of temperatures: Minimum, 24°; maximum, 120°; mean, 66°.
Average rainfall: 17 inches.
Total area irrigable land: 30,000 acres; held in private ownership.
Size of farm units: 40 acres.
Value of irrigated lands: $75 to $175 per acre.
Principal products: Cereals, vegetables, alfalfa (five crops), fruits (citrus and deciduous), also nuts, including almonds and English walnuts.
Duty of water: 3 to 3½ acre-feet per acre measured at headgates.
Watershed area: 790 square miles.
Average rainfall on watershed: 33 inches.
Average annual discharge: 676,000 acre-feet—average for four years.
Storage reservoir: One; area, 1,600 acres; capacity, 40,000 acre-feet.
Storage dams: One; earth and gravel, with concrete core; bottom and top lengths, 40 and 300 feet, respectively; height, 135 feet from bed rock.
Diversion dam: One; concrete 900 feet long.
Length main canal: 20 miles.
Length of laterals: 50 miles.

In 1905 a committee of citizens near Orland, on the west side of the Sacramento Valley, secured the signatures of the owners of 40,000 acres of land to a statement indicating their willingness to comply with the terms of the reclamation act. In February of the following year this committee organized the Orland Water Users Association, and presented a petition to the Secretary of the Interior, in which, after calling attention to the fertility of the soil and the favorable climatic conditions, it was asked that the Federal Government, under the terms of the reclamation act, complete surveys formerly undertaken by the hydrographic branch of the United States Geological Survey and begin the early construction of an irrigation project on Stony Creek in the vicinity of Orland. Accordingly a surveying party and a diamond-drill outfit were put into the field in July, 1906, and field work was continued until November following.

Stony Creek has a drainage area of 780 square miles above the proposed diversion dam, and since 1890 the mean annual run-off has

been about 533,000 acre-feet at Julian's ranch, about 20 miles above the dam. A very small percentage of this amount, however, occurs during the irrigating season; in fact, at times during July and August the stream is practically dry; storage therefore is an obvious necessity for full irrigation.

In the development of the Orland project it is proposed to construct a concrete dam on Little Stony Creek, one of the main branches of Stony Creek, at the East Park reservoir site[a] in order to store sufficient water, when supplemented by the natural flow of Stony Creek during the irrigation season, to irrigate 12,000 to 14,000 acres. This water will be diverted at "Miller Buttes" by a low concrete dam at a point where Stony Creek leaves the foothills and enters the Sacramento Valley. From "Miller Buttes" the water will be conveyed by main canals on either side of Stony Creek 10 miles and distributed over about 7,000 acres on the north side of the creek in the vicinity of Wyo and 7,000 acres on the south side near the town of Orland. On the north side of Stony Creek the Lemon Home Water, Light and Power canal, consisting of about 5 miles of main canal and laterals, and on the south side the Stony Creek irrigation canal, consisting of about 11 miles of main canal and laterals, will be purchased and incorporated into the system.

The lands under the project for the most part have been utilized for many years past for wheat crops, and having been cultivated without any attempt at crop rotation and little fertilization have become badly impoverished. With irrigation and a rotation of crops, however, and with prevailing climatic conditions it has been demonstrated that the quality of the land is unequalled for the profitable production of alfalfa, nuts, and both citrus and deciduous fruits.

The mean elevation of the lands under the project is about 250 feet above sea level. The temperature in winter occasionally falls as low as 24° and in summer reaches 120°; more often, however, it is not higher than 112°.

Following a report and recommendations made in November, 1906, by a board of engineers, the construction of the Orland project was authorized on December 18, 1906, subject to the following conditions:

(1) That 12,000 acres of land be pledged by the owners in a form to be approved by the Department, so that the lands will be held bound to repay the cost of construction under the terms of the reclamation act.

(2) That satisfactory arrangements be made and agreements completed for the adjustment of water rights or for options to purchase certain properties and rights, notably those of the Stony Creek Irrigation Company and the Lemon Home Water and Light Company.

(3) That satisfactory arrangements be made for the purchase of lands needed for reservoir purposes.

(4) That the owners of lands agree to subdivide their holdings in excess of 160 acres into farm units of not to exceed 40 acres.

After reorganizing, which was done to save time in perfecting its by-laws, the Orland Unit Water Users' Association set about with

[a] See Water-Supply and Irrigation Paper, U. S. Geol. Survey, No. 86.

vigor to meet the conditions imposed by the United States. There remains only the securing of an agreement with the Central Canal Company for the adjustment of water rights on Stony Creek to prevent possible litigation before the conditions imposed can be considered as having been met. Upon full compliance with the conditions the construction of the project may be begun.

A temporary office has been maintained at Orland, Cal. No expensive surveys have been undertaken, but an effort has been made to study engineering details so far as the present status of the project would permit.

A summary of the total expenditures is given in the following table:

Total expenditures, according to purpose and nature, on Orland project to June 30, 1907.

[Total, $12,073.19.]

	Services.	Traveling.	Subsistence.	Equipment.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:								
Examination	$3,870.11	$969.18	$572.56	$322.67	$522.08	$95.15	$242.32	.....
Survey	1,566.00	500.73	159.00	160.65	71.36	1.00	69.76	.....
Design	154.05	3.17	.18	.....	.10	.67	.....	$2.02
Subdivision	1.73	9.66	.....	8.13	.....	.22	.....	.....
Building:								
Rights and property	.46	.....	.....	.....	.....	.....	.....	.....
Building	60.92	1.52	.03	4.26	9.53	.37	.....	.....
Administration	1,762.73	276.38	57.85	74.18	199.26	312.41	10.79	.....

SACRAMENTO VALLEY INVESTIGATION.

A description of the Sacramento Valley is given in the Fifth Annual Report, page 94, with a statement of the work accomplished. Nothing is being done here at present except in the directions of maintaining stream measurements. The net expenditures on this project to June 30, 1907, were $34,557.50.

PROPOSED OWENS VALLEY PROJECT.

No further work has been done in Owens Valley, except the continuance of the stream gauging. In the early part of the fiscal year some explorations were made to determine the depth to bed rock at various dam sites, but no detailed surveys or investigations have been made. Negotiations have been completed for the abandonment of this project to the city of Los Angeles, Cal., in accordance with the act of Congress approved June 30, 1906. (34 Stat. L., 801.) The city will be allowed the use of the maps and field notes resulting from surveys, examinations, and river measurements for the sum of $14,000, which amount was fixed by the act as the maximum to be paid therefor. The net expenditures on this project to June 30, 1907, were $26,061.92.

PROPOSED SAN JOAQUIN PROJECT.

In the early part of the fiscal year the field investigations of the underground water conditions in the San Joaquin Valley were brought to a close. This work included a general examination of

the underground water conditions throughout the valley with the object of determining the areas in which underground waters are most accessible for purposes of irrigation or domestic supply. The net expenditures on this project to June 30, 1907, were $3,531.20.

PROPOSED COLORADO RIVER PROJECTS.

There are a number of possible irrigation projects along the Lower Colorado River in California and Arizona. No detailed investigation of their feasibilty has yet been made; but as the construction of such projects would necessitate that storage be provided, surveys have been made on several reservoir sites in Colorado. The fourth annual report contains a description of the work done in this connection, and also of the study of methods of conserving the water supply in the Colorado River basin. The field work was brought to a close in 1905, and no work has been done since that time, except that some borings have been made to determine the foundations at suggested dam sites. The net expenditures on this project to June 30, 1907, are $18,082.39.

CALIFORNIA-ARIZONA.

YUMA PROJECT.

GENERAL STATEMENT.

The principal data relating to the Yuma project are summarized below:

Summary of the principal data relating to the Yuma project.

Counties: Yuma County, Ariz.; Imperial County, Cal.
Latitude: 32° 30′.
Longitude: 114° 30′.
Townships: 3–13 south, ranges 21–25 west, G. & S. R. M., and townships 9–17 south, ranges 16–23 east, S. B. M.
Estimated run-off at Yuma: 11,000,000 acre-feet per annum.
Range of temperature: Maximum, 118°; minimum, 22°; mean, 73°.
Average elevation: 100 to 300 feet above sea level.
Principal products: Semitropical fruits; 7 crops alfalfa.
Nearest railroad: Southern Pacific.
Nearest station: Yuma.
Principal markets: Los Angeles and San Francisco.
Irrigable area: 100,000 acres.
Kind of headworks: Diversion dam.
Reservoir area: Settling basin 10 square miles.
Capacity of reservoir: 25,650 acre-feet.
Duty of water: 5.5 feet
Type of dam: India weir.
Height of dam: 19 feet.
Length of dam: 4,780 feet.
Length of canals: Arizona side, 16 miles; California side, 10 miles.
Length of laterals: 138 miles.
Dikes or levees on Colorado and Gila rivers: 73½ miles.
Per cent public land: 27, including Indian reservation.
Character of soil: Rich alluvium.
Value of irrigated land: $50 to $150 per acre.
Date of completion: 1909, excepting Yuma Indian Reservation, which will probably be the last completed.

The construction of the Yuma project was authorized May 10, 1904. The waters of Colorado River are to be diverted about 10 miles northeast of Yuma, Ariz., into two canals, one on each side of the river. In Arizona these canals will irrigate all the bottom lands of Colorado and Gila rivers between the Laguna dam and the Mexican boundary, and in California the bottom lands of the Yuma Indian Reservation. The Laguna dam will form a basin in which the velocity of the water will be checked and the greater part of the silt allowed to settle. The water from the canals will be drawn from the surface, where it is comparatively free from silt. The dam will have a total length of 4,780 feet, a maximum width of 257 feet, and a maximum height of 19 feet.

During the year many improvements were made to facilitate the work in the field and office. Laguna dam and all construction camps,

as well as several levee stations, were equipped with telephones connecting with a central exchange at headquarters at Yuma. About 50 miles of telephone line were constructed and maintained by the service. Warehouses and freight sheds were erected, and the increased freight, moving to Laguna dam from Yuma, was carried by wagon and steamer. At the headquarters a sewerage system has been installed and other arrangements made with a view to complete sanitation.

The storeroom and commissary have been enlarged to accommodate the extra stock and equipment necessary for supplying the dam and construction camps.

The following table contains a list of contracts entered into for construction work on the Yuma project. These include all contracts for excavation and embankment; cement has in all cases been furnished by the Government.

Contracts for building works on Yuma project to June 30, 1907.

No. of contract.	Contractor.	Feature.	Estimated total value.	Payment.	Per cent.
51	J. G. White & Co	Laguna dam	$797,650.00		34
64	Miller & Peasley	Yuma dike	66,325.00	$72,763.20	100
72	J. G. White & Co	Sluice gates	65,900.00	None.	

LAGUNA DAM[a] AND GATES.

Work on the Laguna dam by the contractors, J. G. White & Co., of New York, was discontinued on January 24, 1907, when by mutual consent the contract was annulled and the Government assumed charge of completing the work by force account. The total amount of work performed by the contractors was 34 per cent. Of the remaining 66 per cent, the Government had completed on June 30, 1907, 28 per cent, making a total completed at that date of 52 per cent. The efficiency of the plant has been increased and the core walls carried to a point where further construction work can not be done until after the present summer overflow of the river. About 750 men have been employed on the construction work. Good stores and mess-house are managed by the Service, as well as an electric-lighting plant and water system.

The following table shows the work done on the Laguna dam to June 30, 1907:

Work done on Laguna dam, June 30, 1907.

Items.	J. G. White & Co.	U. S. Reclamation Service.	Total.
Material excavated, class 1 ..... cubic yards	136,894	89,270	226,164
Material excavated, class 2 ..... do	232,184	59,813	291,997
Rock placed ..... do	114,321	70,700	185,021
Pavement laid ..... square yards	5,391		5,391
Concrete placed ..... cubic yards	952	2,181	3,133
Furnished and driven sheet piling ..... linear feet	50,003	13,164	63,167
Concrete core wall ..... cubic yards	10,010	6,031	16,041
Foundation for lower wall ..... linear feet		1,245	1,245

[a] See Third Annual Report, Reclamation Service, Pl. XV.

DIKES.

A necessary feature of the Yuma project is the protection of the irrigated lands from the overflow of Colorado and Gila rivers. About 50 per cent of the entire levee work has been accomplished. During the past year the Gila Valley dikes were constructed to a point where the proposed Gila crossing was located, and protected with abattis. The Yuma Valley dike was extended during the winter, making its total length now 17 miles. On March 1 the location of the Reservation levee was approved, and all available teams were at once placed on its construction. When the floods of Colorado River stopped further work 260,000 cubic yards, or 55 per cent, of the levee had been finished. The Gila and Reservation dikes, as well as the Yuma Valley extension, were constructed by force account, and the progress made and cost reports show this to be the most satisfactory method.

IRRIGABLE LANDS.

The area comprised in the Yuma project consists mainly of rich alluvial bottom land that is exceedingly fertile. It is believed that the plant food carried by the silt in solution in the river water will perpetually fertilize the land. This region is well adapted to semi-tropical fruits and forage products, seven crops of alfalfa being raised in many places. The distribution of the lands under the project is shown by the following table:

Lands included in Yuma project.

	Acres.	Percentages.		Acres.	Percentages.
GENERAL SUMMARY.			IRRIGABLE—continued.		
Total	97,000		Not under existing canals	36,150	40—
Private	72,400	75—	Public	68,780	75+
Public	24,600	25+	Private	23,370	25+
Irrigable	92,150	95	Subscribed (private)	62,415	91—
Nonirrigable	4,850	5	Unsubscribed (private)	6,365	9+
PRIVATE.			NONIRRIGABLE.		
Total	72,400		Total	4,850	
Irrigable	68,780	95	Public	1,230	25+
Nonirrigable	3,620	5	Private	3,620	75+
PUBLIC.			IN YUMA COUNTY, ARIZ.		
Total	24,600		Total	80,000	
Irrigable	23,370	95	Private	72,400	90+
Nonirrigable	1,230	5	Public	7,600	10—
IRRIGABLE.			Irrigable	76,000	95
Total	92,150		Nonirrigable	4,000	5
In Yuma County, Ariz	76,000	81	IN IMPERIAL COUNTY, CAL.		
In San Diego County, Cal	16,150	19+	Total	17,000	
Gila River Valley	20,758	20+	Private	160	
Yuma Valley	55,242	60	United States Indian Reservation land	16,840	
Yuma Indian Reservation, Cal	16,150	20	Irrigable	16,150	95
Under existing canals	56,000	60+	Nonirrigable	850	5

EXPENDITURES.

The expenditures to June 30, 1907, are summarized in the following tables:

Expenditures, according to physical features, on Yuma project to June 30, 1907.

Features.	Engineering and administration.	Building.
Incidental structures:		
Headquarters, office, and warehouses	$451.75	$8,583.22
Barracks	418.76	7,956.57
Corral	52.65	1,022.37
Stream gaging	269.06	5,112.21
Telephone	140.91	2,677.36
Electric light and water plant	197.81	3,758 37
Pumping plant	32.75	622.41
Improvement, grounds	178.67	3,394.79
Irrigation structures:		
Laguna dam	66,879.40	824,845.99
Gila dikes	4,821.85	59,736.10
Yuma dikes	9,517.49	117,382.40
Reservation dikes	8,436.48	104,049.88
Gila crossing	1,204.30	.....
Yuma conduit	2,253.00	.....
East-side canal	1,874.39	.....
West-side canal	2,209.65	.....
Main canal	7,563.38	.....
Distribution system	13,422.68	.....
Irrigable lands: Examination of Yuma project and other prospective projects on Colorado River	158,499.57	.....
Administration of project as a whole	122,478.16	.....
Store supplies on hand	.....	40,000.00
Total	400,902.71	1,179,141.67
Grand total	1,580,044.38	

Total expenditures, according to purpose and nature, on Yuma project to June 30, 1907.

[Total, $1,580,044.38.]

	Services.	Traveling.	Subsistence	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination	$82,181.78	$14,445.14	$27,377.26	$15,200.57	$35.76	$14,782.18	$25.84	$5,506.77	.....
Survey	32,432.93	5,919.50	1,746.43	5,687.70	64.80	965.16	7.18	232.09	.....
Design	6,349.92	503.94	128.01	288.36	3.50	156.97	85.40	.....	$320.45
Subdivision	224.34	116.69	.....	8.25	.....	9.21	3.82	.....	.....
Building:									
Rights and property	2,948.60	216.55	75.41	.50	150.00	28,742.60	.....	.....	.....
Building	336,101.62	3,542.69	41,708.16	54,036.61	57,131.72	105,343.99	25.00	31,750.71	597,327.39
Administration	69,282.58	7,629.73	8,117.15	6,850.09	177.39	10,371.63	2,535.12	1,169.19	.....

COLORADO.

UNCOMPAHGRE VALLEY PROJECT.

GENERAL STATEMENT.

The principal facts relating to the Uncompahgre Valley project are summarized below:

Summary of principal data relating to the Uncompahgre Valley project.

Counties: Montrose and Delta.
Latitude: 38°.
Longitude: 108°.
Townships: 15 south, ranges 94–96 west; 48–51 north, ranges 7–12 west.
Rainfall: Montrose, 6 to 11 inches; Gunnison, 7 to 13 inches; Whitepine, 8 to 20 inches.
Range of temperature: Maximum, 98°; minimum,,—20°; average, 48°.
Average elevation: 5,000 to 6,400 feet.
Principal products: Alfalfa (three crops), hay, cereals, sugar beets, fruits, vegetables.
Nearest railroad: Denver and Rio Grande.
Nearest station: Montrose (8 miles from Gunnison tunnel); Olathe and Delta on project.
Principal market: Denver; local mining camps.
Irrigable area: 146,000 acres.
Per cent public land: 20.
Watershed area: 3,850 square miles.
Kind of headworks: Diversion dam.
Duty of water: 1 cubic foot per second at the head gates for every 80 acres.
Length of canals: South canal, 12 miles; east canal, 35 miles; west canal, 30 miles.
Power development: Drops along south canal 5,000 to 10,000 horsepower.
Tunnel: Gunnison, 30,583 feet.
Tunnels on south canal: 2,000 feet.
Capacity: 1,300 second-feet.
Character of soil: Red disintegrated sandstone, gravelly adobe and clay loam.
Value of irrigated land: From $50 to $500 per acre.

The construction of the Uncompahgre Valley project was authorized on March 14, 1903.

In the following table are listed the contracts entered into for building works on the Uncompahgre Valley project to June 30, 1907:

Contracts for building work on Uncompahgre Valley project to June 30, 1907.

No. of contract.	Contractor.	Feature.	Estimated total value.	Payments to June 30, 1907.	Per cent paid.
20	E. A. Hess	Telephone south canal	$6,384.00	$5,641.60	100
21	Knowlton & Bollen	Divisions 1, 2, 7 to 9, south canal.	39,668.00	41,010.38	100
22	Orman & Crook	Divisions 3 to 5, south canal.	28,785.00	33,509.85	100
23	Kellogg & Worley	Division 6, south canal	7,060.00	9,973.27	100
25	Taylor-Moore Construction Co.[a]	Gunnison tunnel	1,008,500.00	18,890.05	2
44	J. J. Kewin	Office building	4,166.00	4,166.00	100
45	Montrose Hardware Co.	Heating plant, south canal.	800.00	800.00	100
66	Orman & Crook	Divisions 10–21, south canal.	513,365.00	370,244.13	74
92	McPhee & McGinnity Co.	Cement	42,900.00	42,629.02	100
164	Colorado Portland Cement Co.	.....do	61,500.00	3,105.14	5
182	Smith Bros	South canal division 22	18,254.50	296.94	2

[a] Contractor in default. Work carried on by force account.

GUNNISON TUNNEL.

During the year ended June 30, 1907, work on the Gunnison tunnel was carried forward under a series of difficulties which delayed progress and added enormously to the expense of the work.

During July, 1906, headings No. 3 and No. 4 on the west end were driven to the meeting point. This development materially relieved the ventilation and tramming problem, and all energies were devoted to pushing the work in heading No. 2. In the latter part of July, however, the character of the ground in heading No. 2 changed from a hard, blue shale, which required no advance timbering, to a friable shale filled with loose shell beds and containing a large percentage of lime. The friable nature of the material compelled the use of the crown-bar system of timbering for the protection of the men. This reduced the progress to less than 400 feet per month. The presence of lime in the ground caused a continual slacking with the production of considerable heat, which added to the difficulty of the ventilation problem and destroyed the efficiency of the men.

In November, 1906, a seam of water was encountered which delayed the work for about one week.

In December, 1906, the tunnel was driven into a geologic fault, and a flow of water approximating 25,000,000 gallons per twenty-four hours was tapped. Accompanying this flow of water was an enormous volume of carbon dioxide, or "choke damp," which drove all the men from the tunnel and compelled the abandonment of the ventilating machinery located in the tunnel. After about three weeks the heading was regained, but the flow of gas was so strong and the temperature so high that work was impossible. To overcome this difficulty it was decided to sink a ventilating shaft at a point about 9,000 feet from the west portal as an aid to ventilation. This shaft, 700 feet in depth, was completed in April, 1907.

In the meantime swelling ground had weakened the timbers in about one-half mile of tunnel near the west end. This required the expenditure of large sums of money for reenforcement.

In February, 1907, concrete lining was started in the west end, and by the end of June approximately 4,164 feet of tunnel had been lined with masonry.

The flow of water subsided gradually until the first of June, since which time it has continued at a uniform rate of 1 cubic foot per second.

The presence of the stream of water in the west end has produced the following results:

(1) It has greatly increased the slacking of the shales through which the tunnel was driven, with a consequent increase in temperature. The slacking of the ground has caused the timbers to loosen and give under the pressure, requiring constant attendance and expense to keep them in proper condition. The increase in temperature has necessitated the duplication of ventilation facilities and the operation of the additional machinery necessary to derive the desired benefit from those facilities.

(2) The presence of the water in the tunnel has produced a marked increase in the humidity, so that the men are compelled to work under a high temperature accompanied by a humid atmosphere. This produces a marked depression on workmen and has reduced the efficiency 50 per cent or more.

(3) The presence of the water necessitates the elevation of all tram tracks, and deprives the workmen of all use of the tunnel floor. Tools can not be laid down, as they are covered up and lost. Timbers float away or become water soaked and correspondingly difficult to handle. Tool boxes, powder, lunch pails, nails, repair parts for drills, and every other commodity used in the tunnel must be kept on shelves or platforms or be suspended in some manner above the water. It will be apparent at once that work under such conditions can not be otherwise than expensive.

On account of the expense attendant upon the various operations, and the increasing deterioration of the tunnel structure, the concrete work in the west end has been crowded beyond the point of economic progress for that specific detail in order to stop the loss on other details. The progress made heretofore in placing concrete lining is satisfactory, and at the end of the year the indications point to the probable closing up of all troublesome sections now open prior to January 1, 1908.

On the east end the work has progressed in the main through hard rock of igneous or metamorphic character. At intervals, however, seams of water have been encountered which compelled the abandonment of the work in the heading until the seams drained out. Where such seams have been encountered they have occurred in unstable ground which has required the most careful handling to prevent injuries to the workmen and delay to the work.

The following table shows the progress made on the tunnel during the past year:

Progress made on Gunnison tunnel.

	Year ended June 30, 1906.		Year ended June 30, 1907.	
	East end.	West end.	East end.	West end.
Feet of tunnel driven	3,964	10,080	6,894	13,096
Feet of concrete floor laid				12,200
Feet of tunnel lined with concrete				4,164
Feet of tunnel timbered	97	10,005	245	12,882
Heading advance for the year, feet			2,930	3,016
Feet of tunnel to be excavated	16,538		10,592	

SOUTH CANAL.

The South canal, 12 miles in length, designed to carry the water from the Gunnison tunnel to Uncompahgre River, was divided into 22 divisions for construction purposes. The construction has been carried on entirely under contract, the state of the work on June 30, 1907, being shown by the following tabulation:

Status of contracts, South canal, June 30, 1907.

Division No.	Contractor.	Estimated cost.	Amount paid to date.	Percentage completed.	Date of completion.
1	Knowlton & Bollen	$7,908.00	$11,628.86	100	June 25,1905
2	.....do	6,450.00	5,910.11	100	May 25,1905
3	Orman & Crook	9,010.00	7,950.60	100	Apr. 30,1905
4	.....do	9,635.00	9,464.30	100	Do.
5	.....do	10,140.00	16,094.95	100	Do.
6	Kellogg & Worley	7,060.00	9,973.27	100	Sept. 14,1905
7	Knowlton & Bollen	7,510.00	4,815.80	100	May 25,1905
8	.....do	7,870.00	6,140.24	100	Do.
9	.....do	9,930.00	12,515.37	100	June 25,1905
10	Orman & Crook	51,460.00	25,659.40	62	
11	.....do	29,385.00	16,334.10	68	
12	.....do	20,940.00	4,813.93	33	
13	.....do	46,865.00	39,995.05	99	
14	.....do	35,995.00	31,420.46	100	Aug. —,1906
15	.....do	63,470.00	40,147.87	74	
16	.....do	100,860.00	70,238.64	81	
17	.....do	39,125.00	38,872.41	99	
18	.....do	41,305.00	21,624.55	64	
19	.....do	29,480.00	25,007.37	100	May —,1907
20	.....do	18,905.00	15,666.48	96	
21	.....do	35,575.00	40,463.87	100	Dec. —,1906
22	Smith Bros.[a]	18,254.50	296.94	2	

[a] Informal contract.

DISTRIBUTION SYSTEMS.

On account of the prevailing high prices for contract work, further construction on the West canal, East canal, and other distribution systems will be postponed until the season of 1908 or later.

EXPENDITURES.

The expenditures on the Uncompahgre Valley project are summarized in the following tables:

Expenditures, according to physical features, on Uncompahgre Valley project to June 30, 1907.

Feature.	Engineering and administration.	Building.
Washington office	$63,958.19	.....
Expert engineering	5,866.00	.....
Supervision	20,286.36	.....
Drafting and accounting	21,396.55	.....
South canal	32,379.72	$525,313.61
East canal	8,859.57	.....
West canal	14,110.10	.....
Gunnison tunnel	31,103.91	1,536,023.78
Wagon roads	4,518.35	20,207.74
Hydrography	2,520.33	.....
Land subdivision and legal matters	4,437.95	.....
Montrose office building and grounds	.....	10,575.54
Telephone line	.....	5,961.94
Preliminary topography	68,796.81	.....
Diamond drilling and other examinations	.....	7,731.08
Total	278,233.84	2,105,813.69
Grand total	2,384,047.53	

Total expenditures, according to purpose and nature, on Uncompahgre Valley project to June 30, 1907.

[Total, $2,384,047.53.]

	Services.	Traveling.	Subsistence.	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination	$5,688.43	$615.51	$1,073.12	$287.98	.....	$558.15	$127.96	$136.34	.....
Survey	64,734.91	5,996.95	16,208.59	13,037.36	.....	7,850.82	1,196.87	2,568.37	.....
Design	8,168.61	721.05	657.81	748.01	.....	866.26	216.51	124.69	$260.76
Subdivision	3,465.63	304.85	95.92	167.17	.....	242.05	38.28	144.46	.....
Buildings:									
Rights and property	2,078.72	217.72	.....	.....	.....	124.15	.....	.....	.....
Building	1,046,375.18	3,634.60	.....	107,295.89	$118,085.99	367,079.63	418.68	18,956.09	512,100.29
Administration	50,083.59	5,297.22	1,258.14	4,691.00	.....	7,361.19	1,661.54	1,024.49	.....

PROPOSED GRAND VALLEY PROJECT.

No work has been done during the past fiscal year upon the proposed Grand Valley project. During the next year it may be practicable to take up some of the preliminary surveys so that at the time funds are available for this project the preparatory work will have been brought to completion. The net expenditures to June 30, 1907, are $8,712.20.

PROPOSED WHITE RIVER PROJECT.

No work has been done on the proposed White River project during the past fiscal year. The net expenditures to June 30, 1907, are $4,325.27.

IDAHO.

MINIDOKA PROJECT.

GENERAL STATEMENT.

The general features of the Minidoka project are summarized below:

Summary of principal data relating to Minidoka project.

State: Idaho.
Counties: Lincoln and Cassia.
Townships: 8 to 10 south, ranges 22–25 E, B. M.
Latitude: 42° 11′.
Longitude: 113° 30′.
Altitude: 4,200 feet.
Railway connections: Minidoka and Southwestern Railroad connecting with Oregon Short Line.
Principal markets: Rupert, Heyburn, Burley, and local mines.
Land office for district: Hailey.
Average elevation: 4,200 feet.
Character of soil: Sandy loam.
Range of temperature: Maximum, 96°; minimum, 12°; mean, 45°.
Average rainfall: 15 to 19 inches.
Total area of irrigable lands in gravity section of project: State lands, 6,602; public lands, 77,687; private lands, 286.
Size of farm units: 40 to 80 acres.
Value of irrigated lands: $50 to $100 per acre.
Principal products: Alfalfa (two to three crops), sugar beets, cereals, vegetables, etc.
Duty of water: Estimated average, 4 acre-feet per annum, measured at point of diversion.
Watershed area: 17,900 square miles.
Average discharge: 9,500 second-feet.
Storage reservoir: Area, 30,000 acres; capacity, 900,000 acre-feet.
Storage dams: Number, 1; temporary type, rock-filled crib; dimensions, 15 feet high, 150 feet long.
Diversion dams: Number, 1; type, earth and rock fill; dimensions, 600 feet long, 52 feet high.
Length of main canals: 130 miles.
Length of laterals: 190 miles.
Power developed: 15,000 to 30,000 horsepower.
Power transmission lines: Length, 13 to 20 miles.
Pumping stations: Number, 3; capacity, 300 to 500 second-feet each.

HISTORY OF PROJECT.

Investigations of storage possibilities on Snake River were begun in July, 1902. The canal surveys were first made in March, 1903. A report by a board of engineers recommending the project for the approval of the Secretary was made March 21, 1904. The estimated cost of a water right was at that time placed at $26 per acre. The project was approved by the Secretary April 23, 1904, and the immediate construction of the gravity portion authorized. A con-

tract for the construction of the dam, spillway, etc., was let September 17, 1904, which provided for completion December 17, 1905. Contracts for the construction of the canal system were let in July and August, 1905. All canal contracts were to be completed June 1, 1908. Nearly all of these contracts were, however, extended from one to five months.

COMPLETION OF CONTRACT WORK.

All work on this project, with the exception of a portion of the farm-unit laterals, lateral headgates, and a few minor structures in the main and branch canals, was done by contract. The following is a list of contractors, the portion of the work done by each, the estimated total value of the same, and the date of the completion of each contract:

Record of contracts, Minidoka project, Idaho.

Number of contract.	Contractor.	Feature.	Estimated total value.	Date completed.
17	Bates & Rogers Construction Co	Dam, spillway, etc	$442,612	Sept. 30, 1906
52	W. H. Crumb & Co	Telephone	6,791	Nov. 19, 1905
53	Orman & Crook	Main canal, divisions 1, 5 to 7	441,442	July —, 1907
54	Hubbard & Carlson	Main canal, division 2	128,998	July 21, 1906
55	Monarch & Porter	Main canal, divisions 3, 4	197,779	Nov. —, 1906
56	Vulcan Iron Works	Main canal, division 8	9,522	Oct. 31, 1906
18	Portland Cement Co., of Utah	Cement	59,962	Aug. —, 1906

The dam and spillway were completed in September, 1906. The gates in the diversion channel were lowered during October and the backwater slowly raised until it reached the top of the spillway on November 21. This gave a depth of water of 10 feet in front of the head gates of the main north side canal. The testing disclosed a slight leak around the head gates, so the gates in the diversion channel were raised and the backwater drawn below the bottom grade of the canal. A row of sheet piling was driven along the north side of the forebay, and the north cut-off wall of the head gate was extended a distance of about 40 feet. When the water was again raised there was no sign of seepage and the structure is now considered safe against any probable head of water. The testing of the head gates was finished in February, 1907.

The main north and south side canals (Orman & Crook, contractors) were completed during the month of September, 1906, but owing to the long delay in beginning the construction of the canal structures (schedule 7) work under this contract was not completed until July, 1907. The delay in completing these structures seriously interfered with the operation of the canals and caused a delay of at least one month in delivering water through some of the main branches, resulting in considerable loss to many of the settlers.

The portion of the distributing system lying south of the railroad (Hubbard & Carlson, contractors) was completed early in July, 1906, the delay being only a few days. Work on the portion of the distributing system lying north of the railroad (Monarch & Porter, contractors) was not completed until December, 1906.

FORCE ACCOUNT WORK.

In March, 1906, grading equipment was purchased by the Reclamation Service with a view to immediately beginning the construction of portions of the sublateral system. The contractors, who were resuming work at this time on their grading contracts, were experiencing considerable difficulty in maintaining an adequate force. Fears were expressed by both contractors and settlers that if the Reclamation Service should begin work at this time the forces of some of the contractors who were already far behind on their work might be reduced to such an extent that it would be impossible to finish the construction of the main canals during 1906, so in view of such a possibility it was decided to defer this work until work on the distributing system had advanced to a point where its completion during 1906 would be assured. In September the construction of the sublaterals was begun by the Reclamation Service, and was prosecuted during the greater part of the winter of 1906–7 and completed in June, 1907.

Work preparatory to the construction of concrete head gates for the laterals was done during the winter months, and these gates were constructed as soon as water could be conducted through the canals. An effort was made to install head gates where they would first be needed. In most cases the Service succeeded in constructing head gates before the settler was ready for the water. The scarcity of labor contributed very largely toward delay, it being almost impossible at times to maintain concrete and carpenter crews enough for the purpose. In order to expedite the delivery of water Orman & Crook, contractors, were relieved of five concrete structures, which were to have been placed in some of the branch canals, and timber ones substituted, the work being done by the Reclamation Service. At other points cuts were made around the structures on which the contractors were at work and the water carried by for delivery to the irrigators at points below on the system.

From the beginning of April until June 30 the construction work just described was in progress, while water was delivered between times. By the end of June, 1907, water was available for 980 out of 1,211 farm units on the project.

The canals and branches constructed by contract are capable of conducting water to within one to one and one-half miles of practically every farm unit on the project. The material entering into the construction of these canals is all earth and very easily handled. It was decided that the Reclamation Service should construct the more difficult portions of the sublaterals, and that the settlers should construct the remainder. All of these laterals were surveyed and all portions of the ditches in fills were constructed by the Reclamation Service. The work was done in this manner on sublateral systems containing 190 miles, amounting to 436,000 yards; the remainder left to be done by the settlers averaged less than 5 yards per acre. An effort was made to equalize this work as much as possible.

Many of the claims under the project are held purely for speculation, the holders having made no attempt to prepare the land for cultivation and absolutely refusing to contribute either labor or money toward the construction of the ditches which they will be obliged to use in common with their neighbors; consequently the

bona fide settler who was desirous of using water this season was obliged to do more than his share of ditch building. As a result of this unequal division of the work of lateral building many laterals were built too small and must be enlarged in the near future.

JACKSON LAKE DAM.

Work on the structure at the outlet of Jackson Lake was resumed in June and completed in October, 1907. About 350,000 acre-feet of water will be stored. It is believed this will afford a sufficient regulation of the river's flow for the next five years, at which time it is hoped work can be begun on permanent works at this point. These works will impound from 800,000 to 1,000,000 acre-feet. Offers to cooperate with the United States in the construction of these works have been received from the North and South Side Twin Falls Land and Water companies, the American Falls Canal and Power Company, all Carey Act projects, representing about 275,000 acres, besides several smaller irrigation associations in the Upper Snake River Valley. The works, when completed, will supply water for the late irrigation of from 600,000 to 700,000 acres in the Snake River Valley.

WATER RIGHT PAYMENTS.

Under date of March 9, 1907, the following announcement was made, relating to the time when water would be delivered from this system, the cost of a water right, the time when the first payment would be due, and the charge for maintenance and operation:

In pursuance of the provisions of section 4 of the reclamation act of June 17, 1902 (32 Stat. L., 388), notice is hereby given that water will be furnished from the Minidoka project in Idaho under the provisions of the reclamation act at the opening of the irrigating season of 1907 for the irrigable lands shown upon farm unit plats of townships 9 and 10 south, range 22 east, Boise meridian; townships 9 and 10 south, range 23 east; townships 8, 9, and 10 south, range 24 east; townships 8 and 9 south, range 25 east, approved by the Secretary of the Interior and on file in the local land office at Hailey, Idaho.

The limit of area per entry representing the acreage which, in the opinion of the Secretary of the Interior, may be reasonably required for the support of a family on the lands in question is fixed for the lands entered subject to the provisions of the reclamation act in general at 40 acres within 1½ miles of the towns and 80 acres elsewhere, subject to the variations required by the physical conditions, the amounts being shown upon the plats for the several farm units.

The limit for which water-right application may be made for lands in private ownership shall be 160 acres of irrigable land for each landowner.

The charges which shall be made per acre upon the said entries and upon lands in private ownership which can be irrigated by the waters of the said irrigation project are in two parts, as follows:

(1) The building of the irrigation system, $22 per acre, payable in not less than five nor more than ten annual installments, each not less than $2.20 per acre.

(2) For operation and maintenance, which will, as soon as the data are available, be fixed in proportion to the amount of water used, with a minimum charge per acre whether water is used thereon or not. The operation and maintenance charges for the irrigation season of 1907 will be 40 cents per acre of irrigable land.

The first installment of said charges for all irrigable areas shown on these plats, whether or not water-right application is made therefor or water is used thereon, shall be due and payable on or before December 1, 1907, at the local land office at Hailey, Idaho, the total payment for 1907 being not less than $2.60 per acre. The building charge for subsequent years shall be due and payable at the same place on or before December 1, and the operation and maintenance charge shall become due and be of the amount as announced by the Secretary of *the Interior each year.*

Under the terms of this announcement, payment of installments will be the same on all land classed as irrigable. Scattered throughout the area constituting the gravity division of this project are small tracts of land lying 1 or more feet above the water surface in the gravity canals. In some of the farm units the area of these high tracts is comparatively small, while in others it is considerable. These tracts can, in some instances, be graded and brought into the range of gravity distribution at comparatively small expense, while in other cases it may be necessary to install individual pumping plants.

After a careful investigation of all conditions it was decided that all applicants should make water-right applications for the entire irrigable area within their farm units, whether above or below the water grade, and that the charges should be due and payable for the entire area. It was thought by many of the settlers that the payment of the installments on these high areas before they could be graded off, or other means provided for their irrigation, would work a hardship, and a recommendation was made by the Service that the time of beginning the payment of charges for high lands be postponed for a period of three years unless the Government should install pumping facilities before that time, in which case the payment of such charges should begin at the time when the pumping facilities may become available for irrigation purposes. This recommendation was approved and the following order issued, modifying the announcement referred to:

In view of the fact that certain areas within the Minidoka project, Idaho, are above the grade of the gravity distribution of the water supply, it is hereby ordered that wherever any farm unit contains an area in excess of 3 acres above the grade of gravity distribution, the time for the beginning of payment of the building charges and the operation and maintenance charges for such high areas is hereby fixed for the irrigation season of 1910, the same becoming due and payable in the same manner as other charges under the project on or before December 1, 1910; provided, that if the United States shall install facilities for pumping water from the canals to the higher lands at any time prior to the irrigation season of 1910, the payments of the charges for building, operation, and maintenance shall begin at such time as these pumping facilities shall be available for raising water for irrigation purposes, as hereafter announced.

An appropriate charge for building, operation, and maintenance for these high areas will be made in addition to the charges under the project for the gravity system, except for such areas as by grading are made available for irrigation by gravity.

The acreage subject to the charges under the gravity system, as announced by departmental order of March 9, 1907, will be determined by the officers of the Reclamation Service and will be announced prior to December 1, 1907.

The order of March 9, 1907, as to the payment of charges shall be effective as to the areas under the gravity distribution system as heretofore announced.

DELIVERY OF WATER FOR IRRIGATION.

It was impossible to begin the delivery of water promptly at the beginning of the irrigating season, which, under the laws of Idaho, is April 15. No one, however, would have applied water had it been available at this date. It was not needed, owing to the condition of the soil, which favorable condition continued, with the help of rains, well into June. As fast as the work could be completed, however, water was turned into the canals, in many cases before the settlers were ready to use it. By the end of June nearly 700 second-feet were diverted into the main north-side canal and beneficially applied to

the land. The average results on the project were fully as satisfactory as usually follow the first season's use of water on a large project.

A census of the use of water on the project on June 30, 1907, gave the following results:

Farm units for which water was available June 30, 1907		980
Water-right applications filed prior to June 30, 1907		755
Farm units prepared for irrigation June 30, 1907		516
Farm units prepared and receiving water on June 30		474
Farm units prepared and not receiving water on June 30, 1907		42
Farm units not prepared for irrigation by June 30		695
Irrigable area under present system, high tracts deducted	acres	74,880
Total farm units under present gravity system		1,211
Area in cultivation, 1907	acres	18,192
Area actually irrigated, estimated	do	15,000
Farm units containing cultivated land		737
Percentage in cultivation		25

OPERATION AND MAINTENANCE.

Owing to the unusual contour of the land of this project it was expected that many serious difficulties would have to be overcome during the first season's use of the canal system. Nearly the entire water section for more than 100 of the 130 miles of main canals and branches is above the natural surface, delivery of water being made from both sides of all the canals on the north side of the river throughout their entire length. Almost all the canal embankments were constructed with inside slopes of 3 to 1, outside slopes of 2 to 1, and top widths of 8 feet. The material has, with but few exceptions, proved to be exceptionally well suited for canal embankments.

On account of the high elevation of lands adjacent at many points to these canals it became necessary to deliver water at the maximum level for which the ditches were designed. It was not possible to do this with the permanent checks provided at each main turn-out, owing to the comparatively small volume of water used this season, and even with the temporary checks, which had to be installed, the water surface at many points had to be raised nearly 1 foot above the maximum level provided by the plans. Seepage appeared at many points along the banks, but in only a few places did it suggest any weakness or danger of breakage. Only two small breaks followed the appearance of seepage. Seeps will disappear with the drying out and settling of the banks after the water is turned out at the close of the season.

The flat inside slopes appear to have prevented any serious erosion by wave action, and with a view to the further protection of such slopes they will be seeded to white clover and blue grass. The farmers have been strongly urged to protect their lateral banks by the same means. From the experience to date, breaks due to bad material or poor construction will probably not constitute a large item in the cost of maintaining this system.

The regular force employed in the operation of the system consists of 1 water master and 11 ditch tenders. This force has been able to control and deliver water from 130 miles of canals. It has been necessary to employ a night patrolman on 6 miles of the main north side canal during a part of the season. It is believed, however, that this force can be reduced during the latter part of the season, and after the canals have been in use for a short time some permanent *reduction* can be made.

In addition to distributing the water to the heads of the sublateral systems which are owned and operated by the landowners themselves, the ditch tender has supervision of the distribution of water through each sublateral system of his district, although he may only be called upon occasionally to exercise authority in this direction—only in case of a dispute among the farmers over the division of their water.

Owing to the impossibility of maintaining an uninterrupted service during the present season no rules or regulations were enforced. A careful study has been made of the conditions which will have to be met in administering this system, and appropriate rules and regulations will be drafted for approval and use beginning with the season of 1908.

With a view to facilitating the operation and maintenance of the canals the telephone lines have been extended so as to effectively control every part of the system. Each main canal and branch is numbered and each sublateral system bears a number corresponding to the number of the canal from which it diverts. These numbers, together with the numbers of structures, are intended to facilitate the distribution of expenses incurred in the operation and maintenance of the system.

RIGHT OF WAY.

Practically all right-of-way matters have been settled in connection with this project. Contracts have been entered into and payments made, as shown by the following table:

Agreements for purchase of right of way, Minidoka project.

Name.	Date of agreement.	Number of acres.	Price.	Date paid.
Andrew N. Smith	Oct. 22, 1904	158.7	$1,900	July 13, 1905
Samson-Gifford Co	Oct. 21, 1904	428.7	13,160	Sept. 20, 1905
Geo. W. Hall	Feb. 1, 1906	175.2	5,500	Aug. 15, 1906
Liberty Hunt	Feb. 24, 1906	.....	1,400	Oct. 1, 1906
Francis E. Lish	July 21, 1906	9.8	1,500	Dec. 8, 1906
Ed. Whittle	Mar. 13, 1906	.....	250	Pending.
B. D. Sheffield	Oct. 1, 1906	66.74	2,300	Pending.

TOWN SITES.

The town sites of Heyburn, Rupert, and Acequia have been established on the Minidoka project. All three are on the north side of Snake River in Lincoln County on the line of the Minidoka and Southwestern Railway. The withdrawal of the land for town-site purposes was made by proclamation May 2, 1904, and the survey of the first two sites was made from August to October, 1905. Portions of each of these sites were appraised in July, 1906, and the lots offered for sale August 20, 1906 and August 27, 1906, respectively. The site of Acequia will be surveyed during the fall of 1907.

The expenditures on and revenues from these sites are as follows:

Town site of Heyburn: Receipts from sales of lots to June 30, 1907, $10,975.

Town site of Rupert: Receipts from sales of lots to June 30, 1907, $49,435.

The amount expended on Rupert and Heyburn town sites was $5,346.24.

EXPENDITURES.

The expenditures on the Minidoka project are summarized in the following tables:

Expenditures, according to physical features, on Minidoka project to June 30, 1907.

Features.	Engineering and administration.	Building.
Incidental structures:		
Telephone line	$1,307.00	$6,807.62
Plant equipment and supplies on hand		31,237.49
Irrigation structures:		
Jackson Lake reservoir lands submerged	3,737.89	24,646.62
Temporary dam, Jackson Lake	577.14	16,423.27
Dam and spillway	18,525.02	471,335.18
Main north side canal	8,133.94	214,640.52
Main south side canal	6,735.57	107,396.36
"A" branch and laterals	8,172.54	130,064.53
"B" and "C" branch and laterals	15,791.68	184,839.18
Waste canal "D"	2,018.92	13,102.01
Bridge and structures	4,045.73	70,061.76
Sublaterals, structures, etc	15,055.37	142,329.12
Maintenance and operation		69.20
Irrigable lands:		
Farm unit subdivision and soil examination	3,586.90	
Examination of the project as a whole	79,737.94	
Administration	63,735.95	
Total	231,161.59	1,412,952.86
Grand total	1,644,114.45	

Total expenditures, according to purpose and nature, on Minidoka project to June 30, 1907.

[Total, $1,644,114.45.]

	Services.	Traveling.	Subsistence.	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination	$22,570.35	$2,790.92	$2,323.07	$2,870.01		$1,258.32	$454.01	$239.60	$550.95
Survey	31,169.72	3,397.82	6,302.07	11,377.80	$551.36	2,571.12	73.78	1,792.22	
Design	8,598.35	693.62	87.17	264.35		213.60	56.45		92.05
Subdivision	2,582.36	303.43		105.34		273.29	18.50		
Building:									
Rights and property	2,475.35	237.78	342.22	30.80	22,360.00	2,001.77		40.45	
Building	208,110.09	3,161.05	7,815.43	11,755.39	73,372.03	10,333.47	114.03	16,543.71	1,139,223.28
Operation						17.98			
Administration	31,123.73	2,948.83	9.46	2,239.06		4,752.37	1,524.56		

PAYETTE-BOISE PROJECT.

GENERAL STATEMENT.

The general features of the Payette-Boise project are summarized below:

Summary of principal data relating to Payette-Boise project.

State: Idaho.
Counties: Ada, Canyon, and Owyhee.
Townships: 1 to 10 north, ranges 1 to 5 west, 1 to 2 east.
Latitude: 43° 44′.

Longitude: 116°.
Altitude: 2,250 to 2,800 feet.
Railway connections: Oregon Short Line; Boise, Nampa and Oregon; Idaho Northern.
Principal markets: Payette, Nampa, Boise, Meridian, Caldwell, local mines, Portland, Oreg., and eastern cities for fruit.
Land office for district: Boise.
Average elevation: 2,250 to 2,800 feet.
Character of soil: Light sandy loam.
Range of temperature: Maximum, 104°; minimum, 9°; mean, 56.6°.
Average rainfall: 14.5 inches.
Total area of irrigable lands: 372,000 acres; Government, 127,000; State, 48,000; private, 127,000.
Size of farm units: 40 to 80 acres.
Value of irrigated lands: $50 to $150 per acre.
Principal products: Alfalfa, sugar beets, apples, prunes, etc.
Duty of water: Average, 4 acre-feet per annum, measured at head gates of main canals.
Watershed area: 6,000 square miles.
Average rainfall: 14.5 inches.
Average annual discharge: 3,000 second-feet.
Storage reservoir: Area, 14,500 acres; capacity, 360,000 acre-feet.
Height of dams: Payette dam, 100 feet; Boise dam, 33 feet; Deer Flat reservoir, upper embankment, 70 feet; Deer Flat reservoir, lower embankment, 40 feet.
Length of dams: Payette dam, 400 feet; Boise dam, 400 feet; Deer Flat reservoir, upper embankment, 4,000 feet; Deer Flat reservoir, lower embankment, 7,200 feet.
Canals: Main, length, 200 miles.
Laterals: Length, 100 miles.
Power developed: 12,500 horsepower.
Power transmission lines: 29 miles.

The Payette-Boise project provides for the reclamation of 372,000 acres situated in the Boise and Payette valleys, 300,000 of which are in a desert condition. Investigations of the storage possibilities on the headwaters of Boise and Payette rivers were begun in June, 1902. Preliminary canal surveys were begun in December, 1902. Cooperation by the landowners was first inaugurated in December, 1903, resulting in the organization of a water users' association on August 10, 1904. A report by a board of engineers, recommending the project to the Secretary for his approval, was made February 15, 1905. The Secretary approved the project and authorized the construction of the first division March 27, 1905. Bids were received February 1 to June 30, 1906, and contracts let for the construction of the first division of the project. A general description of the project, including the works for the first division, is given in the Fifth Annual Report, pages 122–132.

BOISE RIVER DAM.

The contract for the construction of the Boise River dam, entered into by the Utah Fireproofing Company, provides for its completion April 1, 1907. This work was begun in March, 1906. No unexpected difficulties were experienced in 1906, but owing to bad management the progress was extremely slow. On April 1, 1907, the date set for its completion, only 41 per cent of work had been done. Unusual rises in the river during January and February, 1907, continued until the regular summer flood of May and June, and, owing to the condition of the work at the time, seriously interfered for several months with its further progress. Since April, 1907, the management of *this work* has been efficient and better progress than here-

tofore has been made. The work may not be completed before January 1, 1908. On June 30, 1907, 51 per cent of this work had been completed.

MAIN CANAL.

UPPER DIVISION.

Work on the upper division of the main canal (W. H. Thompson, contractor) has been progressing in a satisfactory manner. A portion of this work, involving the enlargement of the old New York canal, was done with a revolving derrick. A steam shovel has also been used to good advantage, work with this equipment being prosecuted while the water was flowing in the canal. Seventy-nine per cent of the work under contract was completed June 30, and there will probably be no difficulty in finishing the work by March 1, 1908, the date set for completion.

SECOND AND THIRD DIVISIONS.

Work on the second and third divisions of the main canal, Boise River to Indian Creek (Page & Brinton, contractors), has been progressing somewhat slowly, 37.9 per cent being completed by June 30, 1907. The contractor, however, is hopeful of finishing by March 1, 1908, the time set for completion. A larger per cent of hard material has been encountered than was estimated.

INDIAN CREEK TO DEER FLAT RESERVOIR.

The construction of the division of the main canal from Indian Creek to Deer Flat reservoir (Conway & Wilhite, contractors) has progressed satisfactorily, 84 per cent of the work being completed to June 30, 1907. The date set for completing this contract is October 1, 1907. It is believed that the work will be done by that date, probably with the exception of a short section involved in the injunction proceedings instituted by Mrs. R. E. Green. (See Fifth Annual Report, p. 134.)

LOWER DEER FLAT EMBANKMENT.

Work on the Lower Deer Flat embankment (Hubbard & Carlson, contractors), has been progressing in a satisfactory manner, 74+ per cent being done by June 30, 1907. The date set for the completion of this contract is October 1, 1907. From past rate of progress the work should be practically finished by that date.

UPPER DEER FLAT EMBANKMENT.

The rate of progress on the Upper Deer Flat embankment, which is being done by force account, has since the beginning of the present season been satisfactory, 33 per cent being completed by June 30, 1907. This embankment contains about 1,000,000 yards, being about the same as the lower embankment. The rate of progress, however, has not been so rapid as on the lower embankment, chiefly owing to the fact that all of the material placed therein has to be handled by steam shovels, whereas in the case of the lower embankment

about three-fourths of the material is earth and is hauled from the sides by dump wagons, the output of which depends upon the number of teams employed from time to time. It is not deemed advisable to increase the amount of equipment on this work, so this embankment will probably not be completed before June, 1908, although it may be feasible to turn water into the reservoir before that date.

In addition to the structures on the main canal, which will be constructed by contract (Page & Brinton, contractors), crossings will be provided for the Oregon Short Line and Boise, Nampa and Owyhee railroads. Plans are being prepared for these structures, which will be constructed with the cooperation of the railroad companies, and, on account of traffic, under their general supervision.

DISTRIBUTING CANALS AND LATERALS.

Surveys will be made during the present season of all the main distributing laterals of this system. Main laterals must be constructed from the lower embankment in order to distribute water from the reservoir to the lands extending down the valley between Boise and Snake rivers. These distributaries will cover fully 40,000 acres of desert land. About 8,000 acres of these lands belong to the State of Idaho; the remainder is Government land, practically all of which has been entered under the provisions of the reclamation act and is now occupied by settlers.

An extension of the canal, Boise River to Indian Creek, will be surveyed as far west as the Deer Flat reservoir; also the main branches of the same. This extension and its branches will irrigate about 32,000 acres of land lying south of the Oregon Short Line Railway and extending west as far as the Nampa-Meridian irrigation district. A survey will be made of the extension of the Mason Creek lateral, a part of the Ridenbaugh system, and the property of the Nampa-Meridian irrigation district. This lateral will be extended by the owners of land situated in the irrigation district between the Oregon Short Line Railway and the reservoir. All canal extensions which fix the boundary of irrigable areas must be carefully surveyed, as well as all the principal branches which will have to be constructed before water can be delivered to the land.

RIGHTS OF WAY.

Good progress has been made in the purchase of lands needed for rights of way for the Deer Flat reservoir. The following tables show lands purchased and the status of contracts pending at the close of the present fiscal year:

Agreements for purchase of right of way, Deer Flat reservoir.

Name.	Date of agreement.	Number of acres.	Price.	Date paid.
John Lynch	Oct. 18, 1905	80	$4,800.00	Apr. 18, 1906
D. E. Gott	do	70	6,560.00	May 4, 1906
W. H. Richards	do	38	4,500.00	Apr. 18, 1906
S. C. Scism	do	27	2,700.00	May 31, 1906
Thos. Smith	do	81.7	5,738.00	Do.
F. W. Richards	do	80	8,500.00	Apr. 18, 1906
L. F. Sundman	Apr. 27, 1905	80	1,200.00	Apr. 27, 1906
C. H. Harris	Nov. 21, 1905	94	10,220.00	May 21, 1906
H. A. Partridge	May 25, 1905	320	4,000.00	May 25, 1906

Agreements for purchase of right of way, Deer Flat reservoir—Continued.

Name.	Date of agreement.	Number of acres.	Price.	Date paid.
L. N. B. Carpenter	June 17, 1905	20	$300.00	June 13, 1906
W. H. Conway	Dec. 20, 1905	160	2,400.00	Do.
O. E. Larson	July 18, 1905	22	330.00	June 18, 1906
D. W. Rathfon	Aug. 11, 1905	122	1,830.00	June 23, 1906
W. L. Hasbrouck	.....do.....	160	2,400.00	June 22, 1906
W. H. Jessee	.....do.....	17	255.00	June 6, 1906
T. D. Poston	.....do.....	160	2,400.00	May 5, 1906
Jean McMahon	.....do.....	137	2,055.00	June 13, 1906
Mary E. Ridenbaugh	Sept. 8, 1905	80	1,200.00	June 11, 1906
H. A. Richards	Sept. 15, 1905	10	1,000.00	Apr. 11, 1906
H. B. Aven	Apr. 12, 1905	160	10,000.00	Pending.
Wm. A. Pleasants	Nov. 14, 1905	97	1,455.00	July 16, 1906
L. C. Polley	Jan. 10, 1906	118	1,770.00	July 10, 1906
H. L. Brandt	Aug. 11, 1905	160	2,400.00	July 5, 1906
Do	.....do.....	80	1,200.00	Do.
Do	.....do.....	160	2,400.00	Do.
L. H. Crawford	.....do.....	81.89	1,228.35	July 24, 1906
Wm. J. Duval	Apr. 30, 1906	160	12,000.00	Aug. 25, 1906
F. A. Horner	June 19, 1906	40	175.00	Sept. 25, 1906
A. J. Coe	July 7, 1906	160	75.00	Sept. 14, 1906
C. E. Coe	Aug. 30, 1906	142	3,780.00	Oct. 23, 1906
T. F. Mahaffey	July 2, 1906	60	150.00	Dec. 3, 1906
C. S. Smith	Sept. 10, 1906	160	800.00	Nov. 12, 1906
J. R. Chaney	Sept. 1, 1906	160	3,400.00	Jan. 19, 1907
C. E. Lore	Aug. 31, 1906	125	2,125.00	Jan. 5, 1907
A. Hinkey	Nov. 5, 1906	43	645.00	Feb. 27, 1907
I. B. Ward	Oct. 26, 1906	33	1,000.00	Mar. 4, 1907
M. E. Jones	Jan. 12, 1907	160	4,660.00	June 20, 1907
J. H. Moberly	June 1, 1907	160	2,400.00	Pending.
School district No. 17	Jan. 30, 1907	2	1,050.00	Pending.
Total	.....	3,865.59	115,101.35	

A few tracts held under the homestead law must be acquired for this purpose. The owners of the remaining deeded lands have been tendered a price of $15 an acre, which was fixed by the Water Users' Association as a reasonable one for such lands. This offer being refused, condemnation proceedings have been begun in the Federal district court of Idaho, proceedings being instituted in the case of Silas Wilson. The hearing of this case has been set for the September term of court at Boise.

OPERATION OF THE NEW YORK CANAL.

Under date of March 3, 1906, the United States entered into a contract with the New York Canal and the Idaho-Iowa Lateral and Reservoir companies, providing that the United States should be permitted to enlarge and extend the New York canal as a part of the reclamation plans of this project. The contract also provides that the present users of the New York canal shall receive their water from the new canal when completed, paying their proportional part of the cost of maintenance, etc.

Work was begun at the close of the irrigating season of 1906 at several points on this canal. The beginning of the season of 1907 found it in an unfinished condition at most places and several sections still in the hands of the contractors. The plans of the New York Canal Company for the season of 1907 contemplated the abandonment of the section of their canal between the point of diversion and the Boise River dam, but the noncompletion of this dam necessitated the operation for another season of the canyon section.

In view of the status of the construction work and the consideration which was due the irrigators under this ditch, it was decided, upon request of the New York Canal Company, that the Reclamation Service would assume the management and operation of this system during 1907. The canal is at present capable of diverting about 240 second-feet and irrigates about 10,000 acres of land. Notwithstanding the interference due to the construction then in progress, water was turned into the canal April 18, 1907, and it has been carrying a full head with practically no interruption since that date.

EXPENDITURES.

The expenditures on the Payette-Boise project are summarized in the following tables:

Expenditures according to physical features, on Payette-Boise project to June 30, 1907.

Features.	Engineering and administration.	Building.
Incidental structures:		
Offices, buildings, lodging houses, warehouses, corrals, etc	$150.00	$11,836.46
Irrigation structures:		
Dam in Boise River	8,936.94	83,518.09
Main canal—		
First division	6,466.60	97,864.89
Second division	8,291.73	99,815.10
Third division	8,441.72	171,064.84
New York division		105,230.60
Deer Flat Upper embankment	2,571.85	144,640.47
Deer Flat Lower embankment	1,510.14	182,786.82
Irrigable lands:		
Farm unit subdivision and soil examination	986.67	
Maintenance and operation:		
New York canal		4,606.26
Examination of project as a whole	39,525.68	
Administration of project as a whole	29,773.50	
Total	106,654.83	901,363.53
Grand total	1,008,018.36	

Total expenditures, according to purpose and nature, on Payette-Boise project to June 30, 1907.

[Total, $1,008,018.36.]

	Services.	Traveling.	Subsistence.	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination	$16,094.32	$1,409.46	$2,283.18	$1,013.65		$931.61	$391.01	$461.54	$174.89
Survey	13,989.52	1,147.98	2,200.40	936.58		813.79		711.24	
Design	2,977.42	154.79	16.75	13.36		34.85	53.34	24.00	242.73
Subdivision	865.22	162.96		.49		62.76	4.86		
Building:									
Rights and property	1,606.03	53.35			$101,780.35	400.20		37.50	
Building	95,473.24	2,731.35	6,366.62	67,930.78	59,764.52	16,708.68	254.97	4,762.75	570,865.87
Maintenance	680.47			69.65		105.71			
Operation	518.00					8.74			
Administration	20,583.64	2,041.94	19.85	958.71		2,798.52	1,384.22		

DUBOIS PROJECT.

Surveys and investigations of this project, the largest in the State, were practically completed in 1904. It provides for the reclamation of from 200,000 to 250,000 acres of land west of Dubois on the north edge of the Snake River Valley, at the western end of Fremont County, the land lying chiefly between Mud Lake and the lower end of Big Lost River. The main canal will head on the North Fork of Snake River near St. Anthony, and will cross the Oregon Short Line Railway near Dubois. Practically every storage basin on the North Fork and its tributaries will have to be utilized in connection with this project. A detailed description of the Dubois project is contained in the Fourth Annual Report, pages 151 to 160. The net expenditures on this project to June 30, 1907, were $15,846.44.

KANSAS.

GARDEN CITY PROJECT.

GENERAL STATEMENT.

The principal facts relating to the Garden City Project are summarized below:

Summary of principal data relating to Garden City project.

County: Finney.
Latitude: 38°.
Longitude: 101°.
Townships: Townships 22–24 south, ranges 32–35 west.
Irrigable area: 8,000 acres.
Kind of headworks: 23 pumping stations to recover underground water.
Duty of water: 2 acre-feet per acre per annum.
Average rainfall: 20 inches.
Range of temperature: Maximum, 105°; minimum, —20°.
Average elevation: 2,925 feet.
Principal products: Sugar beets and alfalfa.
Nearest railroad: Atchison, Topeka and Santa Fe.
Nearest station: Garden City.
Principal market: Garden City.
Land office: Dodge City.
Ownership of lands: Private.
Character of soil: Black, sandy loam; fertile.
Value of irrigated land: $75 up.
Date of completion: 1908.

IRRIGABLE AREA.

The land entitled to water under the Finney County Water Users' Association amounts to 8,000 acres. It lies at an average elevation of 2,925 feet above the sea level. The soil is a rich prairie loam, characteristic of the rich plains of western Kansas. The annual range of temperature is from a minimum of 20° below zero to a maximum of about 105° above zero. The average annual rainfall is about 20 inches. The minimum rainfall observed at Dodge City, 50 miles east, during the past thirty years, was 10.12 inches; the maximum rainfall at Dodge City observed between 1875 and 1904 was 33.55 inches. All the land under this project is in private ownership. The total area entitled to water rights comprises 8,600 acres, the size of the farm units being 160 acres each. The irrigable land under this project is valued from $75 to $125 per acre. The principal products are sugar beets, alfalfa, wheat, melons, sweet potatoes, and similar products. There is a beet-sugar factory located at Garden City. The average crop can be grown in the best manner on these lands with 2 acre-feet of water per acre per annum.

PLAN OF IRRIGATION.

The water for this project will be secured from the underflow of the Arkansas River. The power plant is located on the main line of the Santa Fe Railway, near Deerfield, Kans. The power station will develop 600 horsepower in two units with water-tube boilers and De Laval steam turbines. The power will be transmitted electrically by 6,600-volt, three-phase alternating current to 23 pumping stations situated upon the concrete-lined conduit 20,000 feet in length. The ten stations north of the river and the first three south of the river will each have twelve 15-inch wells, 35 to 60 feet deep. The remaining ten stations south of the river will each have twelve 15-inch shallow wells. The power-transmission line has a length of 25,000 feet. Ten of the pumps are located on the north side and thirteen on the south side of the river. The river is crossed by a siphon made of 42-inch internal diameter wooden stave pipe. Each pumping unit consists of a vertical shaft 9-inch centrifugal pump, direct-connected to a 25-horsepower A. C. motor.

HISTORY.

An investigation of the underflow of the Arkansas River was begun June 11, 1904. Preliminary plans and estimates for the Garden City project were submitted to a project board, which met at Denver on March 24, 1905. This board recommended that the surveys and investigations be continued and that alternative estimates be prepared for future consideration. These further plans were considered by a project board which convened on September 5, 1905, at Garden City. The board recommended, first, that the project be constructed as soon as the water-users' association had been organized in satisfactory form and practically the entire area of the land under the project had been subscribed to the water-users' association; and, second, that the preparation of plans and specifications for construction be undertaken at once, so that there should be no delay in beginning construction after the organization of the water-users' association had proceeded to the proper stage. On October 5, 1905, the project was approved, and its construction was begun as soon as practicable after the subscription of all the lands to be benefited, in order to insure the return to the fund of the money expended, in accordance with the reclamation act. On September 14, 1905, the sum of $258,000 was allotted for this project, and on January 8, 1906, an additional allotment of $2,000 was made.

On June 7, 1905, the underflow of Arkansas River at Deerfield, Kans., to the amount of 200 second-feet was appropriated for the United States Reclamation Service, and notice was duly filed and posted, as required by the laws of Kansas. Work has been prosecuted continuously on the project since that date. After approval of the project the Finney County Water Users' Association was incorporated under the laws of Kansas. This corporation received applications from the owners of about 12,000 acres of land, and contracts were approved for lands amounting to 9,625 acres. The area which it is planned to irrigate is restricted to 8,600 acres until it is ascertained whether or not sufficient water will be available for a larger acreage. About 15,000 acres can be covered by the ditch, provided a sufficient amount of water can be recovered from the underflow.

On May 28, 1906, bids were opened for the electrical power plant and contract was awarded to the D'Olier Engineering Company, Philadelphia.

On July 6, 1906, bids were opened for the structures on the Garden City project. No complete bid was received. The structures were readvertised and bids opened at Garden City on September 28, 1906. These bids were all unsatisfactory and were rejected. Construction by force account was authorized on October 9, 1906.

Bids for the pumping apparatus were received at Chicago on July 7, 1906, and contract was awarded to the Camden Iron Works, Camden, N. J., September 12, 1906. Following is an abstract of the bids:

Bids opened July 7, 1906, for pumping apparatus, Garden City project, Kansas.

[Specifications No. 95.]

ITEMS.

Item 1. Furnishing 10 centrifugal pumps, as per specifications.
Item 1 A. Additional lump sum for substituting bronze for cast-iron impellers.
Item 2. Furnishing 23 centrifugal pumps, as per specifications.
Item 2 A. Additional lump sum for substituting bronze for cast-iron impellers.
Item 3. Amount of energy consumed by each motor per foot lift, under estimated maximum lift.

BIDDERS AND AMOUNTS BID.

Byron Jackson Machine Works, Oakland, Cal.: Item 1, $17,500; item 1 A, $450; item 2, $38,000; item 2 A, $1,000; item 3, 25 feet, 750 watts.

J. Edward Ogden Company, 147–149 Cedar street, New York, N. Y.: Item 1, $12,355.75; item 1 A, $495; item 2, $28,418.22; item 2 A, $1,135.50; item 3, motor efficiency, 87.5; no pump efficiency given.

Camden Iron Works, Camden, N. J.: Item 1, $14,200; item 1 A, $240; item 2, $32,250; item 2 A, $550; item 3, 32 feet, 746 watts per foot lift.

Dayton Hydraulic Machinery Company, Dayton, Ohio: Item 1, $16,100; item 1 A, $640; item 2, $37,000; item 2 A, $1,470; item 3, 12 feet, 800 watts.

Henion & Hubbell, 61–69 North Jefferson street, Chicago, Ill.: Item 1, $14,350, $13,350; item 1 A, $400, $400; item 2, $33,000, $30,700; item 2 A, $920, $920; item 3, 60 per cent efficiency on pump, 88–87.5.

D'Olier Engineering Company, Philadelphia, Pa.; item 1, $17,700; item 1 A, $360; item 2, $38,120; item 2 A, $828; item 3, 26.3 feet, 752 watts.

Henry R. Worthington, 114 Liberty street, New York, N. Y.: Item 1, $15,250; item 1 A, $1,350; item 2, $35,075; item 2 A, $3,105; item 3, 31 feet, 750 watts.

Lawrence Machine Company, Lawrence, Mass.: Item 1, $14,432; item 1 A, $950; item 2, $32,825; item 2 A, $2,200; item 3, 31 feet, 710 watts.

Platt Iron Works, Dayton, Ohio: Item 1, $16,000; item 1 A, $550; item 2, $36,000; item 2 A, $1,300; item 3, 65 per cent pump, 86 per cent motor.

United Iron Works, Oakland, Cal.: Item 1, $17,500, $18,500; item 1 A, $750, $750; item 2, $40,250, $42,550; item 2 A, $1,725, $1,725.

Jeanesville Iron Works: Item 1, $17,063; item 1 A, $500; item 2, $38,250; item 2 A, $1,200; item 3, 28.08 feet, 850 watts.

Bids for residence and office building were received at Garden City July 10, 1906. All bids were unsatisfactory and were rejected. Construction by force account was authorized July 24, 1906.

Bids for cement were called for to be opened at Chicago July 6, 1906. All bids received were excessive and were rejected. Readvertisement was ordered and bids were received at Garden City September 28, 1906. Contract was awarded October 11, 1906, to Kansas Portland Cement Company.

Actual work of construction on this project was prosecuted during the winter of 1906–7. The cement-lined conduit was completed in

June, 1907, and the siphon under the river was completed in July, 1907. The power house and power plant were completed in July, 1907. Ten pumping units were received from the Camden Iron Works in July, 1907. By September, 1907, the plant was ready for the operation of these ten units.

Contract for the construction of shallow wells was let to Daly and Patry, of Kansas City, November 7, 1906. Ninety shallow wells on the north side of the river had been completed by August 1, 1907, and work had begun on the wells on the south side of the river. It is expected that all of the wells will be completed in readiness for the irrigation season of 1908.

EXPENDITURES.

The expenditures on this project are summarized in the following tables:

Expenditures, according to physical features, on Garden City project, Kansas, to June 30, 1907.

Features.	Engineering and administration.	Building.
Power house		$45,698.20
River siphon		21,129.82
Concrete conduit		32,016.22
Pump houses		9,887.52
Wells		19,943.01
Headquarters buildings		4,193.15
Temporary structures		3,003.31
Electrical installation		5,090.86
Administration	$23,315.91	
Total	23,315.91	140,962.09
Grand total	$164,278.00	

Total expenditures, according to purpose and nature, on Garden City project to June 30, 1907.

[Total, $164,278.]

	Services.	Traveling.	Subsistence.	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination	$388.71	$512.17	$219.87	$2.92		$107.74	$18.95		
Survey	4,007.08	502.01	822.28	93.12	$103.10	920.33	5.00		
Design	2,186.49	101.86	5.34	55.69	1.13	58.15	43.70		$87.51
Subdivision	13.97	12.54		9.06		7.44	.44		
Building:									
Rights and property	361.83	206.56				29.30			
Building	52,037.68	1,586.17	7,431.50	7,410.73	70,509.92	3,002.59	98.29	$1,174.35	
Administration	8,226.17	712.75	11.65	330.21		740.47	121.23		

MONTANA.

HUNTLEY PROJECT.

GENERAL STATEMENT.

The principal facts relating to the Huntley project are summarized below:

Summary of principal data relating to Huntley project.

County: Yellowstone.
Townships: 2 and 3 north, ranges 27 to 31 east, Montana principal meridian.
Latitude: 46° north.
Longitude: 108° west.
Railway connections: On main line of Northern Pacific Railway and Chicago, Burlington and Quincy Railway.
Principal markets: Chicago, Omaha, Denver, St. Paul, Butte, and Billings, Mont.
Land office for district: Billings, Mont.
Location and extent: Located in the Yellowstone Valley and extends in a compact body from Huntley to Bull Mountain station on the Northern Pacific Railway.
Average elevation: 3,000 feet.
Character of soil: Varying from light, sandy loam to heavy clay.
Range of temperature: Maximum, 100°; minimum, —35° F.
Average rainfall: 10 to 15 inches.
Total area of lands: Public, 32,614.57, divided into 594 farms, of which 26,056.78 acres are irrigable; preference right, 871.30 acres, of which 755.50 acres are irrigable; Indian allotments, 2,729.90 acres, of which 2,333.60 acres are irrigable.
Size of farm units: Approximately 40 acres irrigable and including such pasture or wood lands as are adjacent.
Value of irrigated lands: $50 to $100 per acre.
Principal products: Alfalfa (three crops), forage crops, sugar beets, vegetables, and hardy fruits.
Duty of water: 2½ acre-feet per acre per annum.
Watershed area: 11,180 square miles.
Kind of headworks: Intake from river bed.
Length of canals: 30 miles.
Length of laterals: 200 miles.
Power developed: Drop 14 miles from headworks, develops 600 horsepower to pump water for 3,000 acres on Ballantine Bench.
Pumping station: Type, vertical turbines, direct connections with centrifugal pumps; capacity, 56 second-feet.

Contracts for building work on Huntley project to June 30, 1907.

No. of signed contract.	Contractor.	Feature.	Estimated total value.	Payments to June 30, 1907.	Per cent paid.
59	W. D. Lovell	Structures	$63,917.01	$57,153.18	89
65	Illinois Steel Co	Portland cement	7,813.50	6,949.80	89
70	W. D. Lovell	Main canal, division 2	53,562.53	49,238.03	92
80	Piper Bros. Co	Telephone	7,769.50	7,276.19	100
81	New Jersey Foundry and Machine Co.	Distributing system, schedule No. 6.	9,541.60	9,541.60	100
84	Piper Bros. Co	Distributing system, schedules Nos. 1-5.	150,000.00	106,797.41	70
88	Hughes & Olson	Main canal, division 1	162,000.00	137,022.61	84
114	do	Main canal, division 3 and high line.	77,610.00	41,929.57	54
121	Camden Iron Works	Pumping plant, schedule No. 2.	12,675.00	3,168.75	25

HISTORY.

Within a few days after the passage of the act of April 27, 1904, providing for the investigation of feasible irrigation projects on the ceded strip of the Crow Indian Reservation, in Montana, an engineer was directed to make a reconnaissance. On May 27, 1904, the first field party went into camp on the banks of Yellowstone River, about 2 miles east of Billings, Mont., where a gaging station was established at the Northern Pacific Railway bridge, and then the party moved over into the Bighorn Valley and commenced a preliminary canal location.

On April 18, 1905, the construction of the Huntley project was authorized. An advertisement for bids for the construction of divisions 1, 2, and 3, of the main canal and high line canal was issued April 29, and bids were opened June 28, 1905, at Billings, Mont., but no contracts resulted from the original award. Later a contract for division 2, main canal, was made with W. D. Lovell. Plans and specifications for the building of the principal structures were printed, and by advertisement, dated April 29, proposals were invited for doing the work. The bids were opened June 28, 1905, and contract awarded to W. D. Lovell, who completed the work June 1, 1907.

On August 12, 1905, an advertisement was issued inviting bids for furnishing 7,000 barrels of Portland cement. The bids were opened September 5 and the contract was awarded to the Illinois Steel Company, of Chicago, Ill.

In the meantime surveys of the irrigable land had been made and plans and specifications drawn up for the distributing system. In pursuance of advertisement dated October 14, 1905, bids were opened December 15, 1905. Contract for schedules 1 to 5 was awarded to the Piper Brothers Company, of Pueblo, Colo., who, after constructing part of the work, turned the contract back to the United States on November 15, 1906. The Government is completing the work by force account and will finish it in the fall of 1907. Schedule 6 of the distributing system was awarded to the New Jersey Foundry and Machine Company, and the steel gates, etc., called for in the schedule have been delivered.

An advertisement dated October 25, 1905, called for bids for the construction of a telephone system about 23 miles long. The bids were opened on December 15, 1905, and the work awarded to the Piper Brothers Company, of Pueblo, Colo., who constructed the system and turned it over to the Government May 20, 1906.

Several successive awards were made to bidders under the original advertisement covering the work on division 1 of main canal, but a satisfactory contract could not be obtained. The work was readvertised on November 28, 1905, bids were opened January 15, 1906, and contract was awarded to Hughes & Olson, of Butte, Mont., who have nearly completed the work.

The soil examination was begun on August 24, 1905. On September 18, 1905, a representative of W. D. Lovell appeared and began work. Ground was first broken on the project on October 6, 1905, when excavation for one of the principal concrete structures was commenced. The first car of cement was received on September 30, *1905. Little progress* in construction was made in 1905, however, as

there was delay in receiving steel and cold weather soon prevented effective work. The first canal culvert under the Chicago, Burlington and Quincy Railway was built and some excavating for the structures was done. Work on the structures continued in a small way during the most of the winter and was taken up with a large force in the spring of 1906.

Surveys for the distribution system were continued with three parties during the winter of 1905–6, in spite of snow and cold weather. This was necessary in order to get ready for the contractors, whose contract was signed on January 2, 1906.

The contractor for the distributing system broke ground on Custer Coulée waste way on February 28, 1906, with 8 teams and 12 men.

Division 3, main canal, was awarded to two contractors in succession, and both refused to proceed with the work. It was therefore readvertised under date of May 8, 1906, the specifications calling for the excavation of about 350,000 cubic yards of earth. Bids were opened June 20, 1906, and the contract was awarded to Hughes & Olson, of Butte, Mont.

The specifications for the structures originally included the power house for the pumping plant, but changes in designs made it advisable to draw entirely new plans and to issue a separate advertisement. The new advertisement, dated June 15, 1906, also included the machinery, etc., under schedule 2. The bids were opened August 7, 1906; the contract for the machinery was let to the Camden Iron Works, of New Jersey.

No formal bids were received on schedule 1, covering the erection of the concrete power house, reinforced concrete pipe forebay, etc. Some informal bids were received, but these were too high and it was decided to proceed with the work by force account. Work was begun about October 22, 1906. The pumping-plant machinery will be erected and the whole plant tested during the fall of 1907. All of the work that was to have been finished in the fall of 1906 or spring of 1907 is being completed during the fall of 1907.

The work on division 2, main canal, was completed May 1, 1907, an extension of time having been granted to that date on acount of the increased yardage required to be excavated. A small contract for the excavation of the main canal, from station 515 to 530, was let on December 8 and the work was finished May 1.

Contract work on structures was finished June 1, 1907, the contract having been extended to that date on account of the increased yardage and additional structures required.

The work on division 1, main canal, was sufficiently advanced by May 31, 1907, so that water could be turned into the canal, the contract time having been extended to that date. The tunnels were completed and the gates set, but some additional open-cut excavation must be done when the low-water stage of the river occurs in the fall.

STRUCTURES.

The main canal for a distance of about 2.2 miles carried along the Huntley bluffs. The headworks consist of a reinforced concrete structure provided with two steel gates 5 by 7 feet, and arranged to divert water from Yellowstone River without the necessity for a weir. From the headworks the water is carried through

tunnel No. 1, which is 700 feet long, and thence through a rock cut to tunnel No. 2, which is 1,550 feet long. From tunnel No. 2 the water flows through an open slough and into tunnel No. 3, about 400 feet long. The three tunnels have a total length of 2,650 feet, are 9.2 feet wide, and 9 feet high at the center of the arch. They are lined with concrete and at the entrance to tunnel No. 3 there is a heavy reinforced concrete wasteway, which at low water will discharge under the tracks of the Northern Pacific Railway into Yellowstone River.

At flood stage water can be taken from the river in through the wasteway of the main canal. Tunnel No. 1 carries the water under the Northern Pacific tracks, which are about parallel to the canal throughout this division. This portion of the work was let to Hughes & Olson, contractors, of Butte, Mont. The work is complete, except for a small amount of rock and earth excavation, which will be done at low-water stage and at a convenient time during the fall of 1907.

Division 2 of the Huntley Main canal follows the general direction of the Chicago, Burlington and Quincy Railway eastward to a point about 3 miles from Ballantine. The location of the main canal crossed the original channel of Pryor Creek seven or eight times, and in order to avoid trouble with this stream a new channel was cut 1,500 feet long to carry it directly into Yellowstone River. This new channed cut off between 2 and 3 miles of the old channel of the creek. The new channel of Pryor Creek carries the water over the main canal. A culvert for the main canal was constructed and an additional weir was built, as the original structure was found not sufficient to control the stream. The work on division 2, main canal, was finished on May 1, 1907. The remainder of the main canal, together with the high line canal, was constructed as division 3. The contractors completed the work about the middle of August, 1907.

It was decided that all structures in connection with the main canal should be of a permanent type, and a contract was made with W. D. Lovell providing for the erection of concrete culverts, siphons, etc. This work was completed on June 1, 1907. It included the placing of 2,484.6 cubic yards of concrete on the structures included in the original plans, and 1,019.3 cubic yards of concrete in additional structures, which were paid for as extra work under the specifications.

In order to make an economical location of the main canal two drops were necessary, the first at about a mile east of Ballantine and the second about 4 miles farther. At the first drop a pumping plant is being installed to pump water to the Ballantine bench and the lands along Fly Creek. The main canal at this point will carry about 240 cubic feet of water per second, which will be dropped about 34 feet and will develop power sufficient to raise about 56 cubic feet of water per second to a point 45½ feet above the main canal, where it will be discharged into the high-line canal. The machinery for the pumping plant was furnished by the Camden Iron Works. It reached Ballantine early in July and is now in process of erection. The concrete power house and the concrete pipes in connection therewith are being built by force account, it having been found impossible to obtain reasonable bids. The machinery is of novel design and

has been built especially for this plant. Final payment for it can only be made after the plant has been in satisfactory operation for a period of sixty days. It is expected that this test can be made during the fall of 1907, at which time practically everything else on the system will have been completed.

At the second drop the water is carried down through a concrete pipe, about 800 feet long, and discharged into a diffusion chamber which is provided with a wasteway. At present no use is contemplated for the power which could be developed at this point.

INCIDENTAL OPERATIONS.

The bids for the work under the distribution system were opened on December 15, 1905. A contract was made with the Piper Brothers Company, of Pueblo, Colo., for the excavation, bridges, wooden structures, and concrete structures. The contract for the steel work was awarded to the New Jersey Foundry and Machine Company. The Piper Brothers Company started work on March 1, 1906, and continued on the various parts of the work until November 15, 1906, at which time they turned the plant and equipment over to the United States. The contractors were doing the work at a loss, and finally found themselves unable to complete it. Arrangements were made with the sureties for the contractors, so that the United States could take over the work without disbanding the force, it assumed full charge on November 16, and has since carried on the work as economically as possible. It is expected that the work will be completed in November, 1907.

The New Jersey Foundry and Machine Company has delivered all material and completed its contract.

TELEPHONE SYSTEM.

The telephone system, consisting of 22.7 miles of two-wire metallic circuit line, was finished May 20, 1906. There are eight Government stations on the line and the contractors have been allowed to have their own instrument attached, upon paying the proper charges. The telephone system has been a necessity during the construction period. A contract was entered into with the Mutual Telephone Company, of Billings, Mont., whereby the Government has had free service over the toll line to Billings and connection with the Billings exchange. Contractors and others talking with subscribers to the Billings exchange have paid a 10-cent switching charge to the Government and a regular toll-line charge to the Billings Mutual Company. The telephone system has been well built and is in condition to be extended to the various small towns on the project, in addition to its regular use in the operation of the canal system.

CEMENT.

The first contract for cement for use on the Huntley project was with the Illinois Steel Company, for 7,000 barrels, the final delivery being on September 25, 1906. Other cement has been obtained by contracts on which 6,000 barrels of cement have been received. The total cement required for all the work on this project will be about 20,000 barrels.

IRRIGABLE LANDS.

The lands under the Huntley project are situated in the Yellowstone Valley and extend in a compact body from Huntley to Bull Mountain station on the Northern Pacific Railway. The lands are all on the south side of Yellowstone River, and are crossed by the Northern Pacific Railway and the Chicago, Burlington and Quincy Railway. These unite at Huntley, about 13 miles east of Billings, Mont. The irrigable lands are about 3,000 feet above sea level. The one hundred and eighth meridian west of Greenwich intersects the forty-sixth parallel north latitude near the historic landmark of Pompey's Pillar, 16 miles northeast of Huntley.

Contracts have been let for the construction of 23½ miles of main canal, 6½ miles of high-line canal, structures, distributing system, and pumping plant. This work will develop the irrigable lands as far east as Lost Boy Creek. There will remain a narrow strip of land extending east from Lost Boy Creek to Bull Mountain station, and certain lands along Fly Creek. These lands can be developed by an extension of the main canal to Bull Mountain and the extension of the high-line canal to cover the lands along Fly Creek. Between three and four thousand acres can probably be added by this extension work.

The irrigable lands slope gently toward Yellowstone River. They are in general smooth and there will be little expense in putting them under irrigation. Toward the lower end of the project, however, between 5,000 and 8,000 acres are flat and alkali has accumulated. About one-half of these lands are underlain with gravel at a depth of 3 to 6 feet, and it is thought that by using care no special trouble will be had. The remaining lands have a heavy clayey soil extending to a considerable depth, perhaps 10 or 15 feet, before gravel is encountered. It is probable that a portion of this land should be flooded for a season before crops are grown. The soil on the project in general varies from a heavy clay to light sandy loam. In most places there is a good growth of grass and in some places a heavy growth of sage brush. The alkali lands are distinguished by greasewood, salt grass, and similar plants. Along the river there is in most places a heavy growth of cottonwood trees. This growth will furnish considerable timber for firewood, fences, and general purposes. South of the irrigable land the country rises gradually to the high divide between the Yellowstone and Bighorn rivers. This country is covered with grass and is suitable for grazing of stock. Across the river from the Huntley project, at the western end, is an irrigated bench which is just being developed under the Carey Act. Lower down the river the country slopes back into a series of rough broken hills suitable for grazing and having more or less pine and cedar trees.

The lateral system has been laid out to deliver water to the high point on each farm unit and the various turnouts, culverts, bridges, etc., required for the operation of the system, the drainage of the land, and the opening of the roads have been installed. The main laterals from the canal are lettered from A to S, inclusive, except H and I, which are omitted. The laterals from the high-line canal are lettered HA, HB, HC, HD, HE, and HF. The first branch from the main B lateral is called BO1, the next branch BO2, etc.

If lateral BO2 has branches the first one would be named BO2-1, and so on. The B, C, and D laterals each have about 25 miles of ditch, including the different branches. These laterals deliver water to more land than any others. The capacity and arrangement of the laterals are such that all of the farms may be irrigated in from ten days to two weeks, but the laterals are not large enough for the irrigation of all the land at the same time.

In laying out the farm units on this project, the policy has been to give each settler about 40 acres of irrigable land and to include with the irrigable land such pasture land or woodland as could be found adjacent. The farms will therefore contain 40 to 160 acres of land, of which 40 or more acres will be classed as irrigable. In many cases fractional lots containing less than 40 acres were joined with adjoining lots, thus bringing the total irrigable land in some farms up to a maximum of 60 or 70 acres. The larger farms are those lying along the main canal and along Yellowstone River, or where broken land occurred.

A careful study of the resources and conditions affecting the farmers in the Yellowstone Valley was made before deciding on the 40-acre farm unit policy. It will be noted that the railroad connections and facilities for shipment are very good. A house-to-house canvass of farmers on irrigated lands near Billings showed that a good living is being made on 40 acres of land. The building of a beet-sugar factory at Billings and the establishment of a creamery at that point, together with the general development of this part of the State, were further reasons why a small farm unit should be adopted.

Owing to the fact that the lands under the Huntley project are flat, and in some cases impregnated with alkali, and also owing to the small farm unit, it was decided best that the Government construct the lateral system so as to deliver water to the high point on each farm unit, and to lay out a system of waste-water ditches which would prevent the outlying lands from becoming water-logged and unfit for cultivation. One hundred and sixty miles of lateral ditches and 65 miles of waste-water ditches are required to develop about 29,000 acres of irrigable land.

It is expected that the settlers will put in a large grain crop the first season, and that ultimately the land will be used principally for raising alfalfa, native hay, grain, sugar beets, garden truck, and the hardier fruits, such as the small fruits and certain varieties of apples.

One of the allotees living on the Huntley lands and having a private ditch last year raised some very fine cantaloupes and melons on his place. Sweet corn can be raised, and also tomatoes, by starting them under glass.

The main canal is taken out at the bottom level of the Yellowstone River about 2½ miles west of Huntley. The canal diverts at normal capacity about 400 second-feet of water from the Yellowstone River. Filings in proper form have been made for 750 second-feet of water. The notice of appropriation was filed in Book E, page 106, of Yellowstone County records, on October 26, 1905. A copy of the notice of appropriation was posted October 28, 1905, near the point of diversion, and an affidavit of the posting of said notice was made and filed with the recorder for Yellowstone County March 2, 1906. The

excess filed on over about 500 second-feet is for domestic use, for developing power for pumping, and for other purposes.

The original contracts for the Huntley project were made to provide for the completion of the work in the fall of 1906, so that the project could be opened for settlement and lands irrigated during the season of 1907. After the majority of the Huntley project contracts were let the price of material and labor advanced in some cases as much as 25 per cent. The great demand for labor and teams resulted in a condition such that it was impossible for the contractors to complete their work. As the price of labor went up the efficiency decreased, so that the contractors in some cases had to turn over their work to the United States, and in others were able to complete only at a financial loss. It was therefore found necessary to announce that water could not be delivered in time for irrigating a crop in 1907, although an irrigation for fall plowing was furnished. It was, however, decided to open the lands to settlement so that the settlers could build their houses and fences, break up their lands, and have everything ready to actually make a crop in 1908.

On May 21, 1907, the President issued a proclamation declaring that the lands shown upon the approved farm unit plats of the Huntley project would, on and after July 22, 1907, be opened to settlement, entry, and disposition under the provisions of the reclamation act and the act of April 27, 1904.

In order that the settlement of these lands might be effected in an orderly manner, the intending settlers were required to register at the district land office located at Billings, Mont., before 4.30 p. m., June 25, 1907. At 9 o'clock a. m. the next day, in the presence of the Secretary of the Interior, a drawing was made from the registered applicants and 1,000 numbers were drawn. Beginning July 22, the applicants corresponding to the first fifty numbers were allowed to file on the lands. Each day thereafter fifty persons were allowed to file, until the names on the list were exhausted. Any lands not taken prior to August 23, 1907, might be filed on without restriction.

The Huntley project was formally opened on June 26, in the presence of the Secretary of the Interior, the Senators from Montana, the director and chief engineer of the Reclamation Service, government and railway officials, and citizens to the number of seven or eight hundred.

The settlers on the Huntley lands will be required to make a first payment of $4.60 per acre. This is made up of a first payment against the cost of construction, of $3 per acre, based on an estimated cost of $30 per acre for construction on the system; a first payment of $1 per acre, due under the act of April 27, 1904, to the Crow Indians, and 60 cents per acre, the estimated charge for maintenance for the first year the system is in operation. The settlers will have to pay the charge of $3 per acre each year, but the maintenance charge may be changed if the facts warrant. There will remain due $3 for the Crow Indians, which must be paid in four equal annual installments, beginning at the end of the second year. The total cost of these lands to the settler, including maintenance and operation for ten years, will probably be about $40 per acre.

The following table shows the distribution of the lands under the Huntley project:

Lands included in the Huntley project.

	Acres.	Percentage.		Acres.	Percentage.
GENERAL.			IRRIGABLE.		
Total withdrawn area	58,080		Total	33,000	
Allotted lands	4,360	7.50	Under main canal west of Lost Boy Creek	23,750	78.00
Public lands	53,720	92.50	Under high line canal	3,400	10.30
Irrigable lands	33,000	56.90	Under proposed extensions	3,850	11.70
Nonirrigable lands	25,080	43.10			
ALLOTTED.			NONIRRIGABLE.		
Total	4,360		Total	25,080	
Irrigable	3,300	75.70	Included in farms under main canal west of Lost Boy Creek	6,000	23.90
Nonirrigable	1,060	24.30	Included in farms under high line canal	2,700	10.80
PUBLIC.			Included in farms under proposed extensions	4,000	15.90
Total	53,720		Withdrawn area adjacent to farms	12,380	49.40
Irrigable	29,700	55.20			
Nonirrigable	24,020	44.80			

TOWN SITES.

Before laying out the farm units on the Huntley project, it was decided to have a town site every 5 or 6 miles on the two transcontinental railroad systems. The land having been withdrawn under the first form, it was easy to arrange this in the best manner. The two railroads involved gave their hearty cooperation and have put in switches and passing tracks at the town sites selected.

In planning for town sites in a thickly settled irrigated district, it was considered good policy to have the town sites close together to insure shipping facilities and to give a chance for schools and supply points close to the farms. In connection with several of the town sites, 1-, 2-, and 3-acre tracts have been laid off, which are suitable for a home with garden, orchard, and cow lot, but which are close to the business of the town. In accordance with this policy the town sites of Huntley, Osborn, Worden, Ballantine, Cartersville, Anita, Pompey's Pillar, and Bull Mountain have been laid out. Huntley and Osborn are on both railroads—Ballantine and Anita on the Chicago, Burlington and Quincy Railway, and the remaining town sites on the Northern Pacific Railway. All the town sites are in Yellowstone County, Mont.

The town sites were surveyed during the spring of 1907, and stone monuments were set at the intersection of the principal streets.

It was decided to appraise only a portion of each town site because there would be at first only a limited demand for lots. Whenever at any particular town site the growth is such that there is a demand for more lots, another appraisement can be made in accordance with the demonstrated and prospective value of the remaining lots at that time. Probably some lots would also be reserved from the second appraisement, and so on.

EXPENDITURES.

The expenditures on this project are summarized in the following tables:

Expenditures, according to physical features, on Huntley project to June 30, 1907.

Features.	Engineering and administration.	Building.
Incidental structures:		
Telephone line, 22.7 miles	$189.38	$7,276.19
Offices, cottages, lodgings and boarding houses, warehouses, corrals, etc	525.99	13,683.15
Irrigation structures:		
Main canal and high-line canal	26,286.78	283,233.23
Main-canal structures, including power plant	14,785.58	60,048.48
		25,529.61
Distributing system	20,009.19	115,241.83
Irrigable lands:		
Farm-unit subdivision and soil examination	8,188.93	
Examination of the project as a whole	5,089.85	
Administration of the project as a whole	29,145.12	
Total	104,220.82	505,012.49
Grand total	$609,233.31	

Total expenditures, according to purpose and nature, on Huntley project to June 30, 1907.

[Total, $609,233.31.]

	Services.	Traveling.	Subsistence.	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination	$3,776.47	$637.90	$67.32	$374.29		$323.57	$26.76	$8.00	$122.66
Survey	15,937.82	1,921.28	5,190.41	4,148.31		1,986.20	17.23	1,019.35	
Design	7,632.11	211.13	219.68	203.27		72.16	30.65		137.57
Subdivision	8,291.65	203.41	819.27	64.34		195.81	3.25	67.31	
Building:									
Rights and property	149.30	121.91		21.00		54.05			
Building	97,298.45	1,319.68	15,859.85	18,112.51	$22,799.82	31,230.41	88.67	16,448.58	32,668.56
Administration	21,648.96	1,817.07	11.43	689.64		1,861.74	322.50		

LOWER MILK RIVER PROJECT.

GENERAL STATEMENT.

The main features of the Lower Milk River project are summarized below:

Summary of principal data relating to Lower Milk River project.

State: Montana.
Counties: Choteau, Valley.
Latitude: 48° 30′.
Longitude: 107°–110°.
Railway connections: Havre, Chinook, Harlem, Malta, Glasgow, all on the Great Northern Railway.
Principal markets: Local.
Irrigable area: 250,000 acres in the valley of the Milk River.
Average elevation: 2,200.
Character of soil: Loam and clay.
Range of temperature: —45° to 90°.

Average rainfall: 12 inches.
Ownership of land: 50 per cent Government land, 50 per cent in private ownership.
Size of farm units: 160 acres.
Value of irrigated land: $40 per acre.
Principal products: Hay, grain, and vegetables.
Duty of water: 2 acre-feet per annum.
Watershed area: 14,000 square miles.
Storage reservoir: Capacity 437,500 acre-feet.
Storage dam: Concrete and earth, 90 feet high, 2,210 feet long.
Diversion dam: Concrete.
Canals: Length, 275 miles.
Tunnel: 500 feet long, capacity 2,000 second-feet.
Dike: 2,500 feet long.

IRRIGABLE AREA.

The Milk River project as designed contemplates reclaiming over 250,000 acres, divided into two diversions: (1) 91,970 acres near Chinook; (2) 158,900 acres extending from the Dodson diversion dam eastward to Glasgow. The following table shows areas that can be reclaimed under these systems:

Areas under Milk River system.

		Acres.
Chinook system:		
Chinook North canal, 38.3 miles		44,000
Chinook South canal, 57 miles:		
West of Indian reservation		14,975
On Indian reservation		32,995
		91,970
Dodson system:		
Malta South canal	31 miles	20,671
Malta North canal	30 miles	14,021
Beaver Creek canal	32 miles	13,894
Bowdoin North canal	65 miles	46,127
Bowdoin South canal	84 miles	48,370
Hinsdale canal	35 miles	13,723
Mud Lake outlet	10 miles	2,094
Total	287 miles	158,900
Grand total		250,870

In the Fifth Annual Report, page 154, is shown the distribution of lands, by acres and percentages, both private and public, irrigable and nonirrigable. In general, the private and public lands are just about equal, or each 50 per cent of the total. The State, outside of sections 16 and 36 in each township, does not control any large bodies of land. The Great Northern Railroad, as it had no land grants, does not control large holdings.

The average size of the present private farm unit is about 200 acres; for this project it will probably be placed at 160 acres. The value of irrigated land at present ranges from $25 to $50 per acre. The average duty of water, from measurements taken on private canals, is 18 inches.

The range of altitude is from 2,000 feet at Glasgow to 2,400 feet above sea level at Havre. The range of temperature is from 90° above 45° below. The average precipitation is 13 inches.

IRRIGATION PLAN.

Milk River has its source in the United States, in the rolling country immediately east of the St. Mary basin. Its two forks, North Fork and South Fork, flow northward into Canada, where they unite and continue as Milk River proper in an easterly direction for about 100 miles. At longitude 110° 30″ the river reenters the United States, finally emptying into Missouri River. The water supply of this stream is very uncertain, and in some years its run-off is large, while in other years it is very small.

The general plan for the irrigation of the valley comprises the construction of the Chain Lakes reservoir, the upper end of which in only a few miles below the international line. This reservoir will store the flood waters of Milk River and any of the stored waters of the St. Mary River that may be turned into it. The waters will be turned out of the reservoir and allowed to continue down the main channel of Milk River. Two diversion systems are planned for the valley: One known as the Chinook system, comprising the Chinook North and South Canals, heading 3 miles southeast of the town of Chinook, and the other known as the Dodson system, comprising two canals from either bank of the stream, heading about 22 miles west of the town of Malta.

WATER SUPPLY.

A number of gaging stations have been maintained on Milk River and its tributaries in the United States. The following table shows the total annual run-off of the main river at Havre and Malta:

Run-off of Milk River, at Havre and Malta, Mont., in acre-feet.

Year.	Havre.	Malta.	Year.	Havre.	Malta.
1898	205,146	.....	1903	306,516	404,076
1899	402,512	.....	1904	165,214	280,577
1900	111,202	.....	1905	17,110	31,070
1901	162,788	.....	1906	76,700	293,000
1902	426,226	.....			

ENGINEERING PLANS.

The Chain Lakes dam is planned to be located at a point 30 miles northwest of Havre, on Milk River. It is to be 92 feet in height, and the reservoir created will have a capacity of 466,950 acre-feet. The dam, as outlined, will be an earthen structure of a top length of 2,250 feet, and the slopes will be 3 to 1 on the upper and 2 to 1 on the lower side. The general elevation of the river bottom at this point is 2,555 feet, making the top of the dam an elevation of 2,647 feet. The elevation of the spillway will be 2,632 feet.

The Chinook diversions contemplate the construction of a dam 14 feet high across the main channel of Milk River at a point 3 miles southeast of the town of Chinook. The dimensions of the Chinook North canal at the head are as follows: Width, 30 feet; depth, 6.9 feet; side slopes, 1.5 to 1; grade, 0.0001; discharge, 515 second-feet. The total length of canal is 38 miles, and the area covered is 44,000 acres. The elevation of the bottom of the canal at the head will be *2,383 feet.*

The Chinook south canal at the head will have, according to present plans, the following dimensions: Bottom width, 30 feet; depth of water, 6 feet; grade, 0.0002; discharge, 540 second-feet. The elevation of the bottom of the canal at the head will be 2,384 feet. The diversion dam will be of concrete, with a long concrete apron in the lower end. The elevation of the top of the dam will be 2,390 feet, and the length on top 250 feet.

DODSON DIVERSION.

The general plan of diversion here contemplates the construction of a concrete overflow dam with a maximum elevation above the river of 29 feet. The length of the crest will be 250 feet. Water will be diverted from either end of the dam, the canal from the north end being known as the Malta north canal, and from the south end, Malta south canal.

The north canal will have the following dimensions: Bottom width, 15 feet; depth, 4.5 feet; side slopes, 1.5 to 1; grade, 0.00025; discharge, 200 second-feet. The length will be 30 miles and the area irrigated 14,000 acres.

The Malta south canal at the head will have the following dimensions: Bottom width, 27 feet; depth of water, 7 feet; side slopes, 1.5 to 1; grade, 0.0003; discharge, 800 second-feet. This canal, at 42 miles from the head, will discharge into Mud Lake reservoir. The elevation of the water surface in this reservoir, when it is filled, will be 2,240 feet. The capacity will be 190,430 acre-feet. It will be necessary, however, to divert the water at the 2,195-foot elevation, and this will give a capacity of 179,515 acre-feet.

Extending from Mud Lake reservoir are planned two canals, known as the north reservoir canal and the south reservoir canal. The former will have a discharge of 560 second-feet, will be 65 miles long, and wil lcarry water for 46,127 acres. The south reservoir canal will have a discharge of 615 second-feet, will be 84 miles long, and will carry water for 48,370 acres.

LITIGATION.

A number of private canals divert water from Milk River in the vicinity of Chinook and Harlem. Their legal status has never been determined, and the order of priority or the amount of water to which each is entitled is not known. Before the United States can safely begin any extensive works in the valley it is necessary that the legal status of these various canals be determined. After considerable discussion the settlers of the valley decided to enter into a general law suit for the determination of their respective water rights. At about the time the case was to be called another suit was instituted in the Federal court on behalf of the Fort Belknap Indians. This suit was decided in favor of the Indians, decreeing them 5,000 miner's inches, or 125 second-feet, and giving them a priority over all private canals, although the latter were previously constructed. The decision was based on the interpretation of the treaty with the Indians when the boundaries of the present Fort Belknap Indian Reservation were defined. The decision in this Federal suit was sustained by the court

of appeals at San Francisco. It is now before the Supreme Court of the United States. On account of this Federal suit the private suit above referred to for the adjudication of the water rights of the entire valley has been postponed until a decision has been handed down from the Supreme Court.

EXPENDITURES.

The expenditures on the Lower Milk River project to June 30, 1907, were $87,094.92.

ST. MARY PROJECT.

GENERAL STATEMENT.

The main features of the St. Mary project are summarized below:

Summary of principal data relating to St. Mary project.

State: Montana.
County: Teton.
Latitude: 49°.
Longitude: 113°.
Railway connections: Browning, on Great Northern Railway.
Principal markets: Local.
Watershed area: 452 square miles.
Average rainfall on watershed: About 60 inches.
Estimated run-off: 40 inches.
Storage reservoir: Capacity, 150,000 acre-feet.
Storage dam: Earthen embankment, 42 feet high, 2,070 feet long.
Canal: Length, 25 miles.
Tunnel: 12,000 feet long; capacity, 850 second-feet.

LOCATION.

This project is located in the extreme north-central part of Montana, in Teton County, longitude 130° 30″, latitude 48° 45″. The principal railroad connection is at Browning, Mont., on the Great Northern Railroad, except that some freight is brought in through Canada. The railroad station here is Cardston, Alberta, on the Alberta Railway and Irrigation Company's line. The wagon haul from Browning, Mont., to the works is 36 miles, and from Cardston 28 miles. The land office for the district is at Great Falls, Mont.

IRRIGABLE AREA.

According to the primary plan the St. Mary is not a complete project, but is subsidiary to the main Milk River project. As at present developed, the design is to store the flood waters of the St. Mary basin and conduct them, by means of a canal 25 miles long, to the headwaters of the Milk River. This water thence flows eastward in Canada for a hundred miles or more down the channel of Milk River, reentering the United States in longitude 110° 30′. It then flows in an easterly direction, finally entering the Missouri River in longitude 106° 15′.

A number of private canals have been constructed in Canada, diverting water from both the St. Mary River and Milk River. The above-described plan for utilizing the St. Mary water in the Lower

Milk River Valley is contingent upon an agreement being reached with Canada on the equitable division and use of the waters of both streams in either country. If such an agreement can not be reached, however, the second plan for the development of the St. Mary water will be carried out; that is, to utilize it on lands in the eastern part of the Blackfeet Indian Reservation, and on lands immediately adjacent to the east.

The total area in this vicinity available for irrigation purposes is 100,000 acres. The general range in altitude is from 3,700 to 4,000 feet above sea level. The range of temperature is from 85° above to 45° below, or a total of 130°. The average rainfall on the agricultural land is 15 inches. The precipitation in the drainage basin of the St. Mary River, however, is much in excess of this.

Of the total area, 100,000 acres, about 60,000 acres are on the Indian reservation and the remainder to the east on lands open to settlement. At the last session of Congress provision was made for the throwing open for settlement of the Blackfeet Indian Reservation. The United States therefore controls all of the 60,000 acres. Of the 40,000 acres east of the reservation only a small percentage has passed from the control of the Government. The State owns only a small area outside of the two school sections in each township. The Great Northern Railroad is not a land-grant road, and therefore controls no large blocks of land.

IRRIGATION PLAN.

St. Mary River rises on the eastern slope of the main range of the Rocky Mountains, and among peaks covered with snow the year round. Here are found some of the largest glaciers in the United States outside of the Alaskan Territory. The run-off from this mountainous snow-capped area is large. A number of gaging stations have been maintained on St. Mary River and its tributaries for a number of years. The following table gives the annual discharge in acre-feet at the various stations maintained:

Annual discharge of St. Mary River, in acre-feet.

Year.	St. Mary River at dam site.	Swiftcurrent Creek at mouth.	St. Mary River at international line.
1902	477,913	224,832	.....
1903	539,070	290,385	1,107,294
1904	299,614	194,734	610,409
1905	306,920	162,544	514,100
1906	378,700	179,500	721,000

ENGINEERING PLANS.

It is proposed to build a low-storage dam about three-quarters of a mile below the present outlet of Lower St. Mary Lake. The dam will have a maximum elevation of 45 feet above the bed of the river. The effective height will be 30 feet. The reservoir thus created will have a capacity of 150,000 acre-feet. The top of the earthen dam will have an elevation of 4,498 feet above sea level. The total length

of the embankment will be 2,600 feet. The inner and outer slopes will be 3 to 1. It is intended to use the hydraulic fill method of dam construction. Most of the material will come from the hill west of the dam, and the water to wash it down can be easily obtained from Swiftcurrent Creek by means of a diversion canal 2 miles long.

From the reservoir thus formed water will be diverted through a tunnel 1,100 feet long in the right bank of the river. The formation through which the tunnel will pass is sandstone.

The canal proper will begin at the end of the tunnel. The section at the head will be 27 feet wide on the bottom; 8-foot depth of water; side slopes, 1.5 to 1; fall, 0.0002, or 1.056 feet to the mile. The discharge for these dimensions will be 850 cubic feet per second. At certain stretches of the canal, where it passes along the steep canyon side of the St. Mary River, the section is materially changed. It is given a heavier fall, and the sides and the bottom are to be concrete-lined. The dimensions of ths section are as follows: Bottom width, 7 feet; fall, 0.00125; velocity, 8.66 cubic feet per second; the discharge will remain the same.

GENERAL DESCRIPTION.

The first examination and reconnaissance of this project was made in 1900. It has since been continued up to the present date. The general scheme is divided into two parts: First, storage of the flood waters of the St. Mary River, and their diversion into the headwaters of Milk River; and, second, the utilization of this water on the irrigable lands of the Lower Milk River Valley in Montana.

In many ways this project has presented more difficulties than any other one undertaken by the Reclamation Service. A number of parties of consulting engineers have examined it, considering both engineering problems and the international questions that have arisen with Canada. The construction of the first unit of the project was authorized March 14, 1903.

ST. MARY CANAL.

On July 31, 1906, bids were opened for the construction of the first 14 miles of the St. Mary Canal. Only one bid was received, that of the Puget Sound Bridge and Dredging Company, of Seattle, Wash. It was considered too high and was rejected. An abstract of the bid follows:

Bid of Puget Sound Bridge and Dredging Company, Seattle, Wash., opened July 31, 1906, for 14 miles of main canal, St. Mary project, Montana.

[Specifications No. 97.]

Total amount of bid: $767,505.
Excavation, class 1, 1,400,000 cubic yards: 22½ cents per cubic yard.
Excavation, class 2, 202,000 cubic yards: 62½ cents per cubic yard.
Excavation, class 3, 111,000 cubic yards: $1.80 per cubic yard.
Refilling, 1,300 cubic yards: 45 cents per cubic yard.
Concrete, 5,000 cubic yards: $19.50 per cubic yard.
Placing reinforcing steel in concrete, ⅝-inch bars, or wire fabric, 300,000 pounds: $0.02625 per pound.
Riprap, 300 cubic yards: $3 per cubic yard.
Concrete pipe, 36 inches in diameter, 300 feet: $7.50 per foot.
Concrete pipe, 30 inches in diameter, 500 feet: $5.60 per foot.
Concrete pipe, 24 inches in diameter, 900 feet: $3.85 per foot.
Concrete pipe, 18 inches in diameter, 900 feet: $2.25 per foot.

At the time the foregoing bid was rejected, authority was given to proceed with the construction of the canal by force account. Orders were immediately placed for machinery, including scrapers, dump wagons, steam rock drills, one steam shovel, one Channon-Armstrong excavator, one traction engine and cars for hauling purposes, and other miscellaneous outfit.

The excavator was shipped knocked down, but on account of the lateness of the season and the severe weather conditions, it was not assembled until the spring of 1907.

The steam shovel, a Marion 65-ton model G, was first shipped to Cardston, Canada, the nearest railroad point to the works, and from there brought overland. Railroad track was laid from Cardston to the works on St. Mary River, a distance of about 28 miles, and the shovel taken over same on its own wheels. Its own motive power was used on level stretches. This movement of the shovel continued until the middle of January, when, with the thermometer 35° below, it had to be discontinued until spring, when the trip was completed.

Both the excavator and the steam shovel are now in operation. The material encountered is earth, but it contains many bowlders of about two cubic feet in volume.

EMPLOYMENT OF INDIANS.

The excavation of division 4, or the last 10 miles of the main canal, was reserved for the Indians, the work being located on the Blackfeet Indian Reservation. The Service was ready to employ them by the middle of July, but practically none reported for duty until the end of August. Then employment continued for a month and one-half, when, on account of the lateness of the season, the work was stopped. The greatest number of teams and scrapers employed at any one time was 170. The total amount of excavation by Indians was 79,126 cubic yards. This work was not resumed in the spring, as it was not as satisfactory as was desired.

SAWMILL.

In 1906 two contracts were made with local parties for delivery of logs at the Government sawmill. The first one was for not more than 200,000 feet B. M., and the second for not more than 300,000 feet B. M. The last contractor could only deliver about 75,000 feet before the St. Mary lakes froze up, and his remaining 225,000 feet were caught in the ice. He resumed operations as soon as the ice went out in the spring, and delivered the remainder under his contract during the last month of the fiscal year.

The total amount of lumber sawed up to December 31, or May 31, was 269,231 feet B. M. The total amount planed at the Government planing mill was 42,000 feet B. M. The cost of sawing, including log contract and mill operation, was $13.70 per M feet B. M. The cost of planing was $7.35 per M feet B. M.

TELEPHONE LINE.

Early in the fiscal year the St. Mary's International Telephone Company placed in operation its telephone line from Browning to the Reclamation Service headquarters on St. Mary River, a length of 36 miles. The Service rents three telephones from this company.

Shortly after the completion of the Browning line, the Reclamation Service constructed a telephone line along the canal location. A total length of 23 miles was built, at a cost of $73.34 per mile. Two private parties have connected to the Government line; contracts have been made with them, whereby they pay a monthly rate of $5. For single messages over the Government line, outside of the two private telephones, a toll of 15 cents per message is charged.

BUILDINGS.

Browning is the railroad point for the project. At that place a combined office and residence has been constructed and a stable to facilitate the shipping and freighting operations.

At headquarters on St. Mary River necessary buildings have been put up, lumber for same having been obtained from the Government sawmill.

COAL MINES.

A coal prospect on St. Mary River, 10 miles below the head of the canal and 2 miles south of the international line, has been prospected; a vein of coal has been found about 3 feet 8 inches in width. The strike of the vein is about S. 35° E. The dip to the southwest is about 60°. A tunnel 275 feet long, following the vein, has been driven, from which a considerable quantity of coal has been taken. The coal is considerably crushed, but is of fair quality for use in the steam excavating machinery.

PURCHASE OF RIGHTS OF WAY.

In October, 1906, a conference was had with the chief engineer of the Indian Office and engineers of this Service regarding the appraisement and purchase of Indian lands that would be injured by the construction of the St. Mary reservoir. Consideration was also given and a decision reached as to the value of a right of way for the St. Mary canal on the Blackfeet Indian Reservation, from the head of St. Mary River to the North Fork of Milk River.

EXPENDITURES.

The expenditures on this project are summarized in the following tables:

Expenditures, according to physical features, on St. Mary project to June 30, 1907.

Feature.	Engineering and administration.	Building.
Investigations	$26,097.69	
Canal survey	6,140.27	
Road improvements		$13,338.12
Project buildings		14,327.25
Water works		1,298.57
Assembling excavating machinery, steam shovel, etc		24,370.18
Telephone line		1,687.80
Coal mine		1,346.88
Sawmill and planing mill		3,545.32
Traction train		3,882.28
Corral		8,334.57
Survey, Blackfeet Indian Reservation	11,047.27	
Canal excavation	1,972.16	36,423.43
Gaging streams	957.33	
Administration of the project as a whole	29,311.16	
Total	75,525.88	108,554.40
Grand total	$184,080.28	

Total expenditures, according to purpose and nature, on St. Mary project to June 30, 1907.

[Total, $184,080.28.]

	Services.	Traveling.	Subsistence.	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination	$10,011.82	$1,419.82	$4,119.96	$1,866.08	$32.37	$1,586.81	$89.73	$405.46	$193.60
Survey	8,309.45	1,162.80	3,007.26	4,160.45	.....	671.93	98.13	1,132.98	.....
Design	3,419.91	39.53	195.82	11.30	.....	42.38	16.17	.....	34.10
Subdivision	30.80	14.98	.....	1.66	.....	2.18	1.92	.....	.....
Building:									
Rights and property	.....	.....	.....	.....	800.00	.....	.....	.....	.....
Building	57,757.44	300.14	7,731.46	31,071.39	7,409.44	5,440.54	398.37	4,695.75	2,413.29
Administration	15,439.07	2,191.41	2,046.19	1,937.71	3.65	1,321.91	257.12	786.00	.....

MARIAS PROJECT.

GENERAL STATEMENT.

The main features of the Marias project are summarized below:

Summary of principal data relating to Marias project.

State: Montana.
County: Chouteau.
Latitude: 45°.
Longitude: 111°.
Railroad connections: Havre, on Great Northern Railway.
Principal markets: Local.
Irrigable area: 200,000 acres.
Average elevation: 2,700 feet.
Character of soil: Loam.
Range of temperature: —40° to 100°.
Average rainfall: 13 inches.
Value of irrigated land: $40 per acre.
Principal products: Forage and grain.
Duty of water: 2 acre-feet per annum.
Watershed area: 2,600 square miles.
Estimated run-off: 5 inches.
Storage reservoir: Capacity, 1,000,000-acre feet.
Storage dam: Earthen embankment 200 feet high, 2,246 feet long.
Canal: Length, 266 miles.
Dike: 2,400 feet long.

LOCATION.

This project is located in north-central Montana, in Chouteau and Teton counties. Its boundaries by longitude extend from 110° west to 113° 30′ west. The average latitude is 48° 30′. The Great Northern Railroad traverses the project. The land office for the district is at Great Falls, Mont.

IRRIGABLE AREA.

The area under the Marias system amounts to 200,000 acres, divided as follows:

	Acres.
Marias high-line canal, 150 miles	102,680
South canal, 18 miles	13,670
West reservoir canal, 60 miles	30,160
East reservoir canal, 38 miles	33,740
Total	180,250
Pumping	19,750
Grand total	200,000

The average elevation of the irrigable area is 2,700 feet above sea level. The soil is a sandy loam. The temperature ranges from 100° above to 40° below. The average rainfall is 13 inches.

Of the 200,000 acres about 75 per cent is public lands and 25 per cent is private. The principal products of this system of irrigation would be hay, oats, wheat, and other products of the Temperate zone.

IRRIGATION PLAN.

The headwaters of Marias River lie on the eastern slope of the Rocky Mountains, immediately south of the St. Mary basin. The four tributaries are Cutbank Creek, Two Medicine River, Badger Creek, and Birch Creek. These streams come together at about longitude 112° 20′, and there unite to form the main Marias River. This stream enters Missouri River a few miles south of Fort Benton.

The annual run-off of the Marias River will average in ordinary seasons 1,000,000 acre-feet. In low years it will be not to exceed 500,000 to 600,000 acre-feet.

RESERVOIRS.

During 1902 an investigation into the storage possibilities of the upper Marias basin on the Blackfeet Indian Reservation was made. The most important site was that of Two Medicine River, which was examined in detail. A dam 70 feet high, a short distance below the outlet of the lake, would store 61,000 acre-feet of water; the top length would be 1,640 feet. An 80-foot dam, with a top length of 1,940 feet, would store 74,000 acre-feet of water. In 1904 a survey of the Marias reservoir was made. The dam would be located in what is known as the Sandstone Canyon, almost exactly on the range line between ranges 7 and 8 east. The principal problem here was to determine the height of the dam, so that a safe and economical canal location could be made out of the canyon. As at present contemplated, an earthen structure 195 feet high should be built. The top length of the dam would be 2,246 feet; side slopes, 3 to 1 on the upper and 2 to 1 on the lower; total contents of dam, 3,940,000 cubic yards. The general elevation of the river bottom is 2,685 feet. The spillway will be at 2,865 feet and the top of the dam at 2,880 feet. The storage capacity between the 2,865 and 2,880 contours is 450,730 acre-feet.

DIVERSION CANAL.

The elevation of the bottom of the canal at the head will be 2,855 feet. The grade will be 0.00015, or a fall of 0.792 foot. The dimensions of the canal are: Bottom width, 25 feet; depth of water, 10 feet; side slopes, 1.5 to 1; computed discharge, 1,050 second-feet.

This diversion canal will empty into what is known as Lonesome Lake reservoir, a natural depression in township 29 north, ranges 11 and 12 east. In order to create this reservoir it will be necessary to construct an earthen dam at the outlet, of a maximum height of 49 feet, and also an embankment 24,000 feet in length along the eastern edge of the site with a maximum height of 24 feet. The total capacity of the reservoir will be 201,535 acre-feet.

Discharge from the reservoir will be controlled by gates in an outlet tower. The water will issue at an elevation of 2,750 feet and continue

down the natural channel for 3 miles, or to an elevation of 2,691 feet, at which point two canals, known as the West and East reservoir canals, will be diverted.

GENERAL DESCRIPTION.

This project, when first investigated, was considered as a connecting link between the St. Mary project and the Milk River project. More recently, however, it is contemplated to develop it as a separate project; the water supply is sufficient, and a considerable portion of irrigable land is available. Various consulting engineers have examined this project, but it has not yet received formal approval on account of its unusually difficult engineering features.

EXPENDITURES.

Expenditures on the Marias project to June 30, 1907, were $13,876.76.

SUN RIVER PROJECT.

GENERAL STATEMENT.

The general features of the Sun River project are summarized below:

Summary of principal data relating to Sun River project.

Counties: Teton, Lewis and Clark, Chouteau, Cascade.
Townships: 20 to 25 north, ranges 3 east to 8 west, Montana principal meridian.
Latitude: 47° 30′ to 48°.
Longitude: 111° to 113°.
Railway connections: Great Northern.
Principal markets: Great Falls, Helena, Butte.
Land offices for districts: Helena and Great Falls.
Irrigable area: 16,000 acres in Fort Shaw unit.
Average elevation: 3,700 feet.
Character of soil: Sandy loam, with gravel subsoil.
Range of temperature: Maximum, 100°; minimum, —40°; mean, 44°.
Average rainfall: 12 inches.
Total area of irrigable lands; Public, 180,000 acres; state and school, 21,000 acres; private, 55,000 acres.
Size of farm units: 40 to 160 acres.
Value of irrigated lands: $40 to $200 per acre.
Principal products: Grains, alfalfa, hay, sugar beets.
Duty of water: 1½ acre-feet per acre per annum.
Watershed area: 850 square miles.
Average annual discharge to be utilized: 500,000 acre-feet.
Storage reservoirs: Warm Springs, area 1,976 acres, capacity 156,860 acre-feet; Willow Creek, area 2,285 acres, capacity 84,320 acre-feet; Pishkun, area 1,542 acres, capacity 45,747 acre-feet.
Storage dams: Warm Springs, loose rock with hydraulic fill backing, 213 feet high, length on crest, 762 feet; Willow Creek, hydraulic fill, 110 feet high, length on crest, 1,045 feet.
Diversion dams: Canyon, reenforced concrete, 72 feet high, length 150 feet on crest; Deep Creek, reenforced concrete, 12 high and 100 feet long.
Canals: Main, length south side, 8 miles; north side, 52.1 miles. Teton Slope, 83.1 miles. Fort Shaw, 12 miles.
Laterals: Fort Shaw, 39.5 miles.
Distributing and waste ditches: Fort Shaw, 44.5 miles.
Tunnels: On main canals, No. 1, length 5,000 feet; No. 2, 1,400 feet; No. 4, 2,200 feet; No. 5, 2,000 feet.
Reservoir outlets: Warm springs, 1,000 feet; Pishkun No. 3, 430 feet; Willow Creek, 584 feet.

Detailed statements as to the Sun River project, its canals, reservoirs, and irrigable lands, previous examinations and surveys, have been given in former reports of the Reclamation Service, as follows: In the Third Annual Report, pages 307–313; Fourth Annual Report, pages 215–224; Fifth Annual Report, pages 155–159. The construction of the project was authorized on February 26, 1906.

The irrigable lands and structures of this project lie between the Rocky Mountains on the west, Missouri River on the east, Sun River on the south, and Teton River on the north. The country is comparatively level, comprising large plateaus or bench lands, through which run Sun River, Teton River, and a number of smaller streams. These valleys are mostly irrigated, and the ordinary summer flow of the rivers and streams is practically all utilized.

The general plan now contemplated is to store the flood waters of Sun River and its tributaries and carry them to the higher bench lands. The amount of water annually available averages 570,000 acre-feet.

A general reconnaissance of the lands lying between Sun and Teton rivers, known as the North Side, was made in 1904, whereby it was discovered that there was a large acreage of excellent irrigable land in that region, much more than could be reclaimed by the present available water supply, and all the plans that have been since considered in connection with this part of the project have had in view the ultimate extension of the canal system to cover such additional lands as future use of the water may show to be available.

Location surveys were made during 1905 on the north side for the North supply canal, High line and Teton slope canals. Surveys were also made of storage reservoirs for the entire project and three sites determined upon—Warm Springs, in the mountains, 12 miles above the point of diversion in Sun River Canyon; Pishkun, on the north side of the river, about 13½ miles from the mountains, and Willow Creek, on the south side of the river, about 15 miles from the mountains. The Pishkun reservoir will supply the High line and Teton slope canals, and Willow Creek will supply the Fort Shaw unit, and also provide for prior appropriations, which would otherwise be deprived of water by the north side diversion in low-water periods. The supply canal from the diversion site to Willow Creek reservoir was also located for a distance of 8 miles during 1905. Detail surveys of these reservoirs and drillings for the determination of the geological conditions to be encountered in building the structures were made the same year.

The Warm Springs dam is planned to be 213 feet high and 762 feet long on the crest, with an outlet tunneled 1,000 feet through solid rock. The diversion weir at Sun River Canyon is to be built of reenforced concrete, 72 feet high, and 150 feet in length on the crest. The Willow Creek dam will be of the hydraulic-fill type, 110 feet high and 1,045 feet long, with a concrete-lined outlet tunnel 584 feet long. There will be seven tunnels, with a total length of 12,598 feet, No. 1, the longest, being 5,000 feet.

There are planned two important pressure pipes on the Teton slope canal, one at Priest Butte Sag, 4,400 feet long and 9.25 feet in diameter, and one at the Montana and Great Northern Railroad crossing, 3,400 feet in length and 6 feet in diameter.

On the Fort Shaw distributing system there will be a pressure pipe across Simms Creek 1,650 feet long and 5 feet 3 inches diameter. These pipes are to be constructed of reenforced concrete.

The water after leaving the diversion site at the canyon will be carried on the south side to Willow Creek reservoir and on the north side to the Pishkun reservoir, where it will be divided. Part will go through the High line canal and part through a 430-foot tunnel into natural channels, through which it will flow to the head of the Teton slope canal on Deep Creek.

Surveys on the north side were discontinued in April, 1906, as the allotment of $500,000, approved March 19, 1906, was not sufficient to produce results upon that part of the project, and the engineering force was moved to the Fort Shaw Military Reservation, where some 16,000 acres of irrigable land could be watered.

The investigations of 1905 showed that the lands on the south side of Sun River are rougher than those on the north side and the cost per acre irrigated would be greater. The owners of private lands being disinclined to favor a new canal to be built by the United States, all idea of reclamation on this side was abandoned, with the exception of the Fort Shaw Reservation and adjacent lands.

TIME OF COMPLETION.

The 16,000 acres of the Fort Shaw unit will be supplied with water during 1908. The time when the rest of the system will be completed and the acreage served is entirely dependent upon the amounts and dates of future allotments. It seems probable now that the entire project will not be completed and the whole acreage irrigated before 1914, although after 1910 the reclaimed acreage should increase materially each year.

RECENT OPERATIONS.

Nothing has been done upon the north side the past year, owing to lack of authorization and funds, and no additional work has been done on the south side supply canal.

WILLOW CREEK RESERVOIR.

During the winter of 1906–7 designs for an earth dam and the auxiliary outlet structures for the Willow Creek dam, with contract specifications for same (No. 130), were prepared. Advertisement was made for proposals to be received and opened March 15, 1907. No bids of any kind were received. A board of engineers, after examining the situation, recommended that construction proceed by force account. This was authorized on April 29.

Test pits were dug to determine the amount and character of the material available within reach of hydraulic methods. It was found that there is plenty of suitable material so located that it can be sluiced into the dam by conducting the waters of Willow Creek through a supply ditch 2 miles long to a point 40 feet above the highest point of use. This will not give sufficient head to produce the required pressure upon the nozzle of the "giant." Consequently it is planned to augment the pressure by the use of centrifugal pumps actuated by a steam turbine engine.

It is not vital at present to add to the water supply of the irrigation season, for in ordinary years the summer flow is sufficient for the Fort Shaw lands as well as the prior appropriators, and it is only in extremely dry years like 1905–6, and after the completion of the north side work, with its total utilization of the water, that this storage will be a necessity. Also the winter of 1906–7 was one of more than average snowfall in the mountains, and the present summer has been the wettest known in about forty years. For these reasons it is not expected that the flow of the Sun River will be below normal for at least two years; consequently no damage to the Fort Shaw lands will arise before the dam can be completed.

The discharge of Willow Creek for the two dry years of 1905–6, available for storage in the reservoir and for hydraulicking purposes, is shown in the following table:

Discharge of Willow Creek, Montana, 1905–6.

Month.	Maximum.	Minimum.	Mean.	Total acre-feet.	Month.	Maximum.	Minimum.	Mean.	Total acre-feet.
1905.	*c. f. s.*	*c. f. s.*	*c. f. s.*		1906.	*c. f. s.*	*c. f. s.*	*c. f. s.*	
June	103	27	58	3,451	March	24	4	8.8	541
July	72	9	26	1,599	April	19	7	10.0	595
August	53	12	19	1,168	May	94	4	16.4	1,010
September	12	3	8	476	June	53	10	30.5	1,810
October	8	3	5	307	July	10	5	6.6	406
November	9	3	6	357	August	24	5	8.4	516
December	8	3	6	369	September	11	7	9.1	542
					October	13	6	7.9	486
				7,727	November	14	7	10.1	601
					December	21	8	11.5	707
1906.									
January	9	7	7.3	449	The year	94	4	11.2	8,070
February	9	5	7.4	411					

The work which has been carried on during the season is that of driving the outlet tunnel, sinking the shaft for the gate control, concreting them, and preparing to set the gate which has been bought.

Bids for gate and fixtures were opened April 30, and were as follows:

Bids opened April 30, 1907, for gate and fixtures for outlet tunnel, Sun River project, Montana.

ITEMS.

Item 1. Circular sluice gate.
Item 2. Wall pipe.
Item 3. Shaft for gate.
Item 4. Shaft guides.
Item 5. Gate stand.

BIDDERS AND AMOUNT BID.

New Jersey Foundry and Machine Company, New York, N. Y.: Total, $969.25; item 1, $540; item 2, $206; item 3, $109; item 4, $5.25; item 5, $109. Delivery of item 2, f. o. b. Bloomsburg, Pa.; all other items Newburgh, N. Y.

Chapman Valve Manufacturing Company, Indian Orchard, Mass.: Total, $928.83; item 1, $510; item 2, $150.81; item 3, $85.32; item 4, $3.70; item 5, $179. Delivery f. o. b. Indian Orchard, Mass.

The contract was awarded to the Chapman Valve Company.

Concrete lining started on August 10, 1907, and it is expected that the entire lining will be placed, gates set, and work completed by November 1, 1907. After this is accomplished work will be discontinued for the season.

FORT SHAW UNIT.

The bill opening the abandoned Fort Shaw Military Reservation to settlement was approved June 9, 1906. Preliminary canal surveys were made during the following summer. A topographic map was made of the irrigable portion of the reservation and adjacent lands on the sloping area; the scale was 1,000 feet to the inch, with 5-foot contour intervals; on the flats near the river the scale was 400 feet to the inch and contour intervals were 2 feet.

These flats are so smooth that the distributing system was carried along the subdivision lines wherever practicable. This course necessitated the immediate subdivision of the unsurveyed reservation. Members of the Sun River force of the Reclamation Service were detailed to make the survey, acting under instructions from the General Land Office through the surveyor-general for Montana. The survey was completed September 15, 1906. Immediately thereafter the lateral system, location of which had begun, was carried to completion.

During the winter of 1906–7 detailed plans of structures, profiles, estimates, and specifications were prepared. Advertisement was issued and proposals opened April 3, 1907, for the five divisions, embracing the following work: Division 1, about 6 miles of main canal from headworks to east end of Simms Creek siphon; division 2, about 6 miles of canal from east end of Simms Creek siphon to end of main canal; division 3, lateral D, about 21 miles (including 4 miles of sublaterals); division 4, lateral A, about 39 miles (including 12 miles of sublaterals and 17 miles of waste-water ditches); division 5, lateral C, about 24 miles (including 9 miles of sublaterals). There were two schedules: A, grading, and B, structures. The following bids were received on schedule A, divisions 2, 3, 4, and 5:

Bids opened April 3, 1907, for canals and structures, Fort Shaw unit, Sun River project, Montana.

[Specifications No. 131.]

BIDDERS.

A: J. C. Furman, Augusta, Mont.; division 2, schedule A, $24,700.

B: C. E. Crepeau, Fort Benton, Mont.; division 2, schedule A, $29,600; division 4, schedule A, $25,310; division 5, schedule A, $24,055.

C: Sequist, Clark & Johnson, Simms, Mont.; division 3, schedule A, $30,240; division 4, schedule A, $24,390; division 5, schedule A, $23,740.

D: Bailey & Dupee, Great Falls, Mont.; division 3, schedule A, $30,035; division 4, schedule A, $23,735; division 5, schedule A, $19,720.

DIVISION 1, SCHEDULE A.

No bids.

DIVISION 2, SCHEDULE A.

Excavation, class 1, 75,000 cu. yds.:
Bidder A, 30 cents per cu. yd.
Bidder B, 35 cents per cu. yd.

DIVISION 2, SCHEDULE A—Continued.

Excavation, class 2, 2,000 cu. yds.:
Bidder A, 55 cents per cu. yd.
Bidder B, 75 cents per cu. yd.

Excavation, class 3, 200 cu. yds.:
Bidder A, $1.25 per cu. yd.
Bidder B, $1 per cu. yd.

Overhaul, 5,000 cu. yds.:
Bidder A, 2 cents per cu. yd. per 100 ft.
Bidder B, 3 cents per cu. yd. per 100 ft.

Puddling, 500 cu. yds.:
Bidder A, $1.50 per cu. yd.
Bidder B, $3 per cu. yd.

DIVISION 3, SCHEDULE A.

Excavation, class 1, 97,000 cu. yds.:
Bidder C, 30 cents per cu. yd.
Bidder D, 30 cents per cu. yd.

Excavation, class 2, 500 cu. yds.:
Bidder C, 60 cents per cu. yd.
Bidder D, 65 cents per cu. yd.

Excavation, class 3, 100 cu. yds.:
Bidder C, $1.20 per cu. yd.
Bidder D, $1 per cu. yd.

DIVISION 3, SCHEDULE A—Continued.

Overhaul, 11,000 cu. yds.:
Bidder C, 2 cents per cu. yd. per 100 ft.
Bidder D, 3 cents per cu. yd. per 100 ft.
Puddling, 200 cu. yds.:
Bidder C, $2.50 per cu. yd.
Bidder D, 90 cents per cu. yd.

DIVISION 4, SCHEDULE A.

Excavation, class 1, 65,000 cu. yds:
Bidder B, 30 cents per cu. yd.
Bidder C, 30 cents per cu. yd.
Bidder D, 30 cents per cu. yd.
Excavation, class 2, 5,000 cu. yds.:
Bidder B, 75 cents per cu. yd.
Bidder C, 60 cents per cu. yd.
Bidder D, 65 cents per cu. yd.
Excavation, class 3, 500 cu. yds.:
Bidder B, $1 per cu. yd.
Bidder C, $1.20 per cu. yd.
Bidder D, $1 per cu. yd.
Overhaul, 2,000 cu. yds.:
Bidder B, 3 cents per cu. yd. per 100 ft.
Bidder C, 2 cents per cu. yd. per 100 ft.
Bidder D, 3 cents per cu. yd. per 100 ft.

DIVISION 4, SCHEDULE A—Continued.

Puddling, 500 cu. yds.:
Bidder B, $3 per cu. yd.
Bidder C, $2.50 per cu. yd.
Bidder D, 85 cents per cu. yd.

DIVISION 5, SCHEDULE A.

Excavation, class 1, 75,000 cu. yds.:
Bidder B, 30 cents per cu. yd.
Bidder C, 30 cents per cu. yd.
Bidder D, 25 cents per cu. yd.
Excavation, class 2, 500 cu. yds.:
Bidder B, 75 cents per cu. yd.
Bidder C, 60 cents per cu. yd.
Bidder D, 60 cents per cu. yd.
Excavation, class 3, 100 cu. yds.:
Bidder B, $1 per cu. yd.
Bidder C, $1.20 per cu. yd.
Bidder D, 90 cents per cu. yd.
Overhaul, 16,000 cu. yds.:
Bidder B, 3 cents per cu. yd. per 100 ft.
Bidder C, 2 cents per cu. yd. per 100 ft.
Bidder D, 3 cents per cu. yd. per 100 ft.
Puddling, 200 cu. yds.:
Bidder B, $3 per cu. yd.
Bidder C, $2.50 per cu. yd.
Bidder D, 50 cents per cu. yd.

Awards were made as follows: Division 2, J. C. Furman; division 3, Sequist, Clark & Johnson; division 4, Charles E. Crepeau; division 5, Bailey & Dupee. No bid was received on division 1, and informal proposals were received April 17, with the result that contract was awarded to W. D. Lovell, Minneapolis, Minn., on the basis of the following proposal:

Informal bid of W. D. Lovell, Minneapolis, Minn., on division 1, schedule A, canals and structures, Fort Shaw unit, Sun River project, Montana.

[Specifications No. 131.]

Total bid, $48,470.
Excavation, class 1, 133,000 cubic yards: 29 cents per cubic yard.
Excavation, class 2, 10,000 cubic yards: 65 cents per cubic yard.
Excavation, class 3, 500 cubic yards: $3 per cubic yard.
Overhaul, 20,000 cubic yards: 2 cents per cubic yard per 100 feet.
Puddling, 1,500 cubic yards: $1 per cubic yard.

No bids were received on Schedule B, and on April 29 authority was granted to do this work by force account.

The contracts call for work in Schedule A to be completed by June 1, 1908. It is probable that J. C. Furman and Bailey & Dupee will finish their work during the fall of 1907, and that all the contracts will be completed well within the time limit.

The important structures consist of headworks, and a pressure pipe across Simms Creek, both of reenforced concrete, and two drops of plain concrete with rough stones embedded in it to check the velocity of the water. The A drop has a length of 175 feet, a width of 4 feet, and a drop of 50 feet; C drop has a length of 785 feet, a width of 8 feet, and a drop of 60 feet. The excavation for the Simms Creek

siphon, the A and C drops, is finished. The cement, reenforcing steel, and concreting machinery are on hand. Work has begun on the small concrete work for drains and turnouts.

The size of the farm unit varies with topographic conditions and the position in which private lands lie. It has been the intention as far as practicable to allow about 40 acres of irrigable land and 120 acres of dry land to each farm. Necessarily the proportions vary in different cases, particularly because of the large number of fractional lots in the land survey.

TOWN SITES.

Two town sites have been selected, Fort Shaw occupying the NW. ¼ sec. 12, T. 20 N., R. 1 W., and Simms occupying the NE. ¼ sec. 13, T. 20 N., R. 3 W. Authority was granted July 26, 1907, for the survey of these town sites, but instructions have not yet issued for actual procedure. The school squares in each town site have been planted with double rows of trees, one row of broad-leaf cottonwood and one row of alternate ash and elm, donated from the Great Falls city nursery by the park commission.

Upon separate lots in these town sites the headquarters camp buildings of the project have been built, so that they may be readily sold to the settlers when vacated by the Reclamation Service. At Fort Shaw, the main headquarters, the buildings consist of an office building with seven rooms and a concrete vault, mess house, three bunk houses, two four-roomed engineers' cottages, stable, storehouse, and blacksmith shop. At Simms there are an office of three rooms, one engineer's cottage, mess house, two bunk houses, and stable. At Vaughn, the railroad station nearest the work, on the Montana and Great Northern branch of the Great Northern Railway, 14 miles from Fort Shaw, a warehouse 34 by 42 feet, with shed-roof addition 11 by 22 feet, has been built.

TELEPHONE LINE.

On November 22, 1906, proposals were received for furnishing and erecting poles for a telephone line from the town of Sun River to the Willow Creek dam, about 40 miles. They were as follows, on 1,200 poles:

Bids opened November 22, 1906, for furnishing and erecting 1,200 telephone poles, Sun River project, Montana.

ITEMS.

Item A. furnishing and erecting 1,200 fir or pine poles.
Item B, furnishing and erecting 1,200 cedar poles.

BIDDERS AND AMOUNTS BID.

J. C. Furman: Item A, $2.75 each; item B, $3.75 each.
E. M. Toman: Item A, $3.25 each.
M. A. Wellman: Item A, $3 each.
A. B. Jones: Item A, $4.85 each.

Contract was awarded to J. C. Furman.

A line of the North Montana Telephone Company runs from Sun River to Great Falls, and a contract was entered into to string two wires upon its poles for this distance, 20 miles, at an annual rental of $3 per mile.

The following is an abstract of proposals received November 22, 1906, for 33,700 pounds No. 10 B. B. telephone wire; prices f. o. b. Vaughn, Mont.:

Bids opened November 22, 1906, for 33,700 pounds of No. 10 B. B. telephone wire, delivery f. o. b. Vaughn, Mont.

Missoula Mercantile Company, Kalispell, Mont.: $3.725 per hundred pounds.
American Steel Wire Company, Denver, Colo.: $3.825 per hundred pounds.
J. W. Stidwell, Great Falls, Mont.: $3.825 per hundred pounds.
Hibbard, Spencer, Bartlett Company, Chicago, Ill.: $3.855 per hundred pounds.
Janny, Semple, Hill & Co., Minneapolis, Minn.: $3.999 per hundred pounds.
Simmons Hardware Company, St. Louis, Mo.: $4 per hundred pounds.
Farwell, Ozman, Kirk & Co., St. Paul, Minn.: $4.065 per hundred pounds.
John T. Cottier, Great Falls, Mont.: $4.65 per hundred pounds.

Contract awarded to Missoula Mercantile Company.

The insulators, telephones, and small supplies were purchased from the American Electric Company, St. Paul, Minn. The line was strung and instruments installed by force account. The total cost of the line was $5,461.25. Instruments are in use at regular stations as follows: Great Falls office, Vaughn warehouse, Sun River, Fort Shaw headquarters, Simms camp, head works, and Willow Creek dam, with two temporary stations for use during construction. The line was opened for service through between Great Falls and Willow Creek dam on May 9, 1907. The service is very satisfactory, and conversations have been had from Willow Creek to Billings, about 400 miles.

RIGHT OF WAY.

Only two pieces of land for canal right of way have had to be purchased for the Fort Shaw canals, one piece of 4.27 acres from Charles F. McKelvey, at $35 per acre, and a piece of 12.59 acres from Lemuel Loomis, 4.53 acres of exceptionally fine alfalfa, costing $200 per acre, the balance costing $30 per acre. The remainder of the lands affected by this canal system are either upon vacant land or come under provisions of the act of August 30, 1890 (26 Stat., 391). The lands to be submerged by the backwater of the Willow Creek reservoir cost $12,000 for 1,600 acres, or $7.50 per acre.

WATER-RIGHT ADJUDICATION.

The adjudication suit over the waters of Sun River has not been brought to a close. There has been no trial in court and the delay has been caused by attempts to settle the matter out of court, basing the amounts and priorities upon the findings of the referee, the facts ascertained by the State engineer's survey, and the gagings of the Reclamation Service. It seems probable that an amicable and just settlement will soon be made.

EXPENDITURES.

The expenditures on the Sun River project are summarized in the following tables:

Expenditures, according to physical features, on Sun River project to June 30, 1907.

Features.	Engineering and administration.	Building.
Incidental structures:		
Offices, lodging, and boarding houses, warehouses, stables, etc	$912.35	$13,756.96
Irrigation structures:		
Willow Creek reservoir, dam, etc	3,700.50	6,798.64
Fort Shaw main canal	8,070.71	7,597.10
Distributing system	6,094.77	7,329.66
Irrigable lands:		
Farm unit subdivision and soil examination	2,225.82	
Examination of project as a whole	67,182.26	
Administration of project as a whole	15,818.40	
Total	104,004.81	35,482.36
Grand total	$139,487.17	

Total expenditures, according to purpose and nature, on Sun River project to June 30, 1907.

[Total, $139,487.17.]

	Services.	Traveling.	Subsistence	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination	$16,215.27	$1,238.03	$3,559.73	$2,637.61		$831.31	$51.41	$1,891.67	$520.77
Survey	21,834.47	2,139.79	5,895.81	2,304.60		1,976.05	119.29	3,170.17	
Design	2,773.07	262.81	23.19	35.41		101.31	7.47		45.62
Subdivision	1,230.02	17.23	100.36	10.08		46.63	2.11	149.83	
Building:									
Rights and property	130.88	125.35							
Building	17,621.45	369.90	5,454.74	8,468.25	11,974.29	2,394.41	9.78	1,876.51	
Administration	15,511.52	1,708.12	137.07	1,651.91		1,476.43	618.65	766.79	

PROPOSED LAKE BASIN PROJECT.

Investigations under this proposed project were made during the field season of 1905, and are described with much collateral data in the Fifth Annual Report of the Reclamation Service, pages 159 to 164.

The lands to be irrigated are in Yellowstone and Sweetgrass counties, between Greycliff and Billings, extending north from the Yellowstone River about 35 miles, in latitude 46° north, longitude 109° west.

The two main bodies of irrigable lands are the Lake basin, containing about 100,000 acres, in townships 1 to 3 north, ranges 19 to 22 east, at elevations ranging from about 3,900 to about 4,200 feet; and the "Twentymile basin," containing about 75,000 acres, in townships 3 and 4 north, ranges 22, 23, and 24 east, at elevations ranging from 3,700 to 4,000 feet. Other smaller tracts may perhaps bring the total to 250,000 acres or more. Alternate sections in this area are railroad lands and are all in private ownership. Very little of the Government land has been taken up.

A sufficient water supply for this area could be obtained only from Yellowstone River and its tributaries, since the flow of Musselshell River and its tributaries is practically all used during the irrigating season for lands adjacent to these streams.

In the detailed statement in the Fifth Annual Report of the Reclamation Service it is shown that the cost of this project would probably be more than $100 per acre with a proposed acreage of 200,000 acres.

The net expenditures on this project to June 30, 1907, were $7,101.76.

PROPOSED CLARK FORK PROJECT.

The area covered by this project is located for the most part in Carbon County, Mont., some comparatively small tracts being in Bighorn County, Wyo., in latitude 45° north, longitude 109° west.

An investigation was made in 1906 with a view of estimating the amount of irrigable land and determining whether a feasible diversion could be made in Clark Fork Canyon. This investigation and its results are described in the Fifth Annual Report of the Reclamation Service on pages 164 to 167.

The diversion contemplated was for the irrigation of lands on the west side of Clark Fork. There are approximately 60,000 acres possibly irrigable under this project, but not more than half of this is first-class land, and probably a third is very rough. The water supply is ample, but construction work would be difficult and expensive. There is some irrigable land east of Clark Fork, but most of it is either too high or too rough to admit of profitable irrigation from the stream mentioned.

The net expenditures on this project to June 30, 1907, were $5,851.13.

PROPOSED MADISON RIVER PROJECT.

The proposed Madison River project covers an area of approximately 150,000 acres, comprising about 43,000 acres in and near to Prickly Pear Valley, about 53,000 acres in the Crow Creek Valley, and other smaller and detached areas, aggregating 54,000 acres. A description of this project, based upon a survey made in 1904 and 1905, is published in the Fifth Annual Report of the Reclamation Service, pages 167 to 172.

The project in general depends upon the feasibility of constructing a gravity canal to divert water from Madison River near the mouth of Cottonwood Canyon. The construction work on such a canal would be very costly. It was estimated to amount to $100 per acre before the present era of high prices. In addition to the high cost of the main canal construction, the flood waters of Madison River must be stored to supplement the low-flow periods. Water-power companies have appropriated the water and largest reservoir sites, and are gradually developing their plants to use all the water. A portion of the lands withdrawn have already been restored to entry.

The net expenditures on this project to June 30, 1907, were $10,568.30.

PROPOSED CROW RESERVATION PROJECT.

This project comprises three divisions, the Fort Custer, Waco-Sanders, and Bighorn, which are described as separate units in the Fifth Annual Report of the Reclamation Service on pages 172 to 174.

The lands are mostly within the ceded strip of the Crow Indian Reservation, in Yellowstone and Rosebud counties, latitude 46° north, longitude 107° to 108° west. The average altitude is 3,000 feet above sea level.

The ceded strip of the Crow Reservation was opened to settlement by proclamation of the President, effective July 16, 1906.

Owing to the condition of the reclamation fund and the desire of private parties to control in the development of these irrigation projects, the lands were not withdrawn under the terms of the reclamation act. The result of this policy has been that the lands were settled without restriction, and a number of futile attempts have been made to organize the settlers and construct irrigation works. Very little has been accomplished, however, and the difficulty experienced in perfecting an organization and financing the larger projects illustrates some of the advantages of the reclamation act. The conditions will probably result in a partial development of the cheapest portions, thus rendering the ultimate development of the large acreage surveyed by the Reclamation Service not feasible, and in this way materially reduce the number of homes that could have been made.

FORT CUSTER DIVISION.

The Fort Custer canal was planned for the irrigation of about 28,000 acres lying in a narrow strip west of Bighorn River and extending from Two Leggin Creek to near the junction with Yellowstone River. Of this area about 8,000 acres were included in the Fort Custer military reservation. A canal 45 miles long has been surveyed to cover these lands. The canal was planned to divert 405 cubic feet of water per second by means of a weir across the Bighorn River, just above Two Leggin Creek.

The lands under this project are very favorable for irrigation. They are crossed by the Chicago, Burlington and Quincy Railway at the new town of Hardin, and at the northern extremity are tributary to the Northern Pacific Railway.

WACO-SANDERS DIVISION.

This project comprises a tract of about 4,000 to 4,500 acres near Waco station, on the Northern Pacific Railway; another tract of from 13,000 to 22,000 acres in the vicinity of Sanders station, and a tract of about 1,500 acres near Bighorn station.

A gravity system, consisting of a small ditch for the Waco lands and a low-line canal for the Sanders flat, is quite feasible. A large development, including pumping plants and power transmission, has also been planned, which provided for the irrigation of about 27,500 acres, at an estimated cost of from $35 to $45 per acre. The Chicago, Milwaukee and St. Paul Railway passes close to the Sanders flat.

BIGHORN DIVISION.

Under this proposed unit the estimated irrigable lands comprise about 50,000 acres of bench land lying west of the Bighorn River. A survey has been made of a canal line from a proposed dam at the mouth of the Bighorn Canyon to Toluca on the Chicago, Burlington and Quincy Railway, with a branch to the bench lands near Pervisa station.

The line considered most feasible, however, would cross Two Leggin Creek by means of a siphon, and thence run along the bench above the Fort Custer Canal until a junction with the Peritsa lateral was effected. A large number of structures would be required for the Bighorn high line, including a high masonry dam, two long siphons, and a drop of about 100 feet at Two Leggin Creek. This line would reduce the area to probably 44,000 acres, of which about 25,000 are within the limits of the Crow Reservation.

If the power available at the diverting dam and at the drop on Two Leggin Creek be developed for pumping and an arrangement made for the use of the stored waters from the Shoshone reservoir in Wyoming, the project will be feasible.

The construction of this project presupposes the opening of the Crow Indian lands or an arrangement by which they are to be developed and pay their proportion of the cost of construction and operation. The lands under this system are particularly fine bench lands, somewhat sheltered by the Bighorn and Pryor ranges, and would be productive under irrigation. At present this country is tributary to the Chicago, Burlington and Quincy Railway, with a haul varying from nothing to 30 miles.

The net expenditures on this project to June 30, 1907, were $21,032.58.

NEBRASKA.

SOUTH PLATTE UNDERFLOW INVESTIGATIONS.

The investigation of the feasibility of obtaining water from the underflow in the valley of South Platte River was brought to a close late in the field season of 1905 and is described in the Fourth Annual Report. The work in this area showed that private capital can best develop the water resources existing in the ground waters and that there is no necessity for plants requiring large capital or Government aid. The length of the valley and its limited width render it impracticable to build a single comprehensive irrigation system. A final report on the investigations in the South Platte Valley has been published by the United States Geological Survey as Water-Supply and Irrigation Paper No. 184. The net expenditures on this project to June 30, 1907, were $2,877.01.

NEBRASKA-WYOMING.

NORTH PLATTE PROJECT.

GENERAL STATEMENT.

The main features of the North Platte project are summarized below:

Summary of principal data relating to North Platte project.

Counties: Sioux, Scottsbluff, Banner, Cheyenne, Nebraska; Natrona, Carbon, Converse, Laramie, Wyoming.
Latitude: 41° 30′.
Longitude: 102°.
Altitude: 3,800 to 4,200 feet.
Railway connections: Chicago, Burlington and Quincy Railway; Union Pacific Railroad, and Colorado and Southern Railway.
Principal markets: Missouri River points, Omaha, Kansas City, St. Joseph, Denver, and central Wyoming.
Land offices: Alliance and North Platte, Nebr., and Cheyenne, Wyo.
Irrigable area: Located in townships 20 to 26 north, ranges 48 to 66 west.
Character of soil: Sandy loam.
Range of temperature: Maximum, 100°; minimum, —25°; mean, 45°.
Average rainfall: 15 inches.
Total area of irrigable lands: Public, 85,000 acres; private, 5,000 acres; State, 10,000 acres.
Size of farm units: 80 acres.
Value of irrigated lands: $50 to $100 per acre.
Principal products: Alfalfa, cereals, corn, sugar beets, and potatoes.

Duty of water: 1½ second-feet per 100 acres.
Watershed area: Above Pathfinder reservoir, 11,000 square miles.
Average annual discharge at reservoir: 1,500,000 acre-feet.
Storage reservoir: Area, 21,774 acres; capacity, 1,025,000 acre-feet.
Storage dam: Arched masonry, length on crest, 500 feet; height, 215 feet.
Diversion dam: Reenforced concrete; length, 325 feet.
Canals: Main canal, length, 95 miles. Dimensions at headgates: Bottom width, 34 feet; side slopes, 1½ to 1; depth of water, 10 feet; capacity of section, 1,400 second-feet. Dimensions at end of ninety-fifth mile: Bottom width, 22 feet; side slopes, 1½ to 1; depth of water, 8½ feet; capacity of section, 800 second-feet.
Canals: Laterals and distributing canals, total length about 305 miles; bottom width varies from 4 to ½ feet; side slopes, 1½ to 1; capacity varies from 175 to 3 cubic feet per second.

HISTORY OF EXAMINATION.

Investigations looking to the development by irrigation of lands in the North Platte Valley were begun prior to 1904. As the flow of the river during the summer months was found to be inadequate, surveys and examinations were commenced with the object of locating on North Platte River or some of its tributaries a storage reservoir of sufficient capacity for the irrigation of these lands. After careful examination it was found that a suitable reservoir could be formed by the construction of a dam across North Platte River in central Wyoming, just below its junction with Sweetwater River and about 45 miles southwest of Casper, Wyo. The construction of these storage works, known as Pathfinder dam and reservoir, was authorized on March 14, 1903, and work commenced during the season of 1905.

The first examination and surveys for the Interstate Canal were commenced during the fall of 1903, when a trial line was run from Guernsey, Wyo., to a point about 10 miles east of the Nebraska-Wyoming line. This line was found to be impracticable and the following spring a new line was started at Whalen, Wyo., and extended to a point about 100 miles east of the Nebraska-Wyoming line. This survey showed a sufficient amount of irrigable land to justify the construction of irrigation works. Accordingly final surveys were made, designs prepared, and construction work commenced early in the season of 1905.

STRUCTURES.

The Pathfinder dam is located on North Platte River 3 miles below the junction with Sweetwater River and about 45 miles southwest of Casper, Wyo. At this point the river flows through a narrow canyon which varies in width from 80 to 180 feet. The dimensions of the dam, which is under construction at this point, are shown in the following table:

Dimensions of Pathfinder dam.

Elevation spillway above sea level	feet	5,850
Elevation top of dam above sea level	do	5,860
Total height of dam from lowest point of foundation to top of parapet	feet	215
Thickness of dam at top	do	16
Thickness of dam at bottom, approximately	do	100
Length of dam, approximately	do	300
Radius of arch	do	150
Batter of upstream face	per cent	15
Batter of downstream face	do	25
Approximate amount of masonry in structure	cubic yards	55,000

A spillway about 600 feet in length, designed for a discharge capacity of approximately 43,000 second-feet, will be constructed at the north end of the dam. This spillway, with the exception of a portion about 150 feet in length, will be excavated in rock. Work on the spillway excavation and preparation of stone for masonry was commenced September 25, 1905, and has continued without interruption to the present time. An excellent foundation has been secured for the dam, and approximately 10,500 cubic yards of masonry have been placed, bringing the dam to an average elevation of 5,690 feet.

The Pathfinder tunnel, 480 feet in length, has been constructed at the north end of the dam to carry the normal flow of the river. This tunnel was completed during the season of 1905. Two 36-inch pipes have been placed through the dam to take the low-water flow of the river during the installation of gates in the tunnel which are to control the discharge of water from the reservoir.

Contract has been awarded for furnishing and installing in the Pathfinder tunnel a set of four high-pressure gates of the sluicing type. This work is to be completed by March 1, 1908.

An earth dike 1,620 feet in length with maximum height of 38 feet will be constructed south of the Pathfinder dam, where the rock surface drops rapidly and falls below the spillway level of the reservoir.

A dam for the diversion of waters released from the Pathfinder reservoir is under construction at the head of the Interstate and proposed Fort Laramie canals, at Whalen, Wyo. This dam is being built under two schedules. Schedule No. 1 consists of an earth dike about 2,000 feet in length, containing approximately 56,100 cubic yards, including gravel cover and paving. Schedule No. 2 includes the masonry overflow portion of the dam, the head gates at each end of the dam, a spillway in the Interstate canal, and the necessary excavation incident to construction. The headworks of both the Interstate and proposed Fort Laramie canals will be built of reenforced concrete with iron gates and lifting devices of standard design. During progress of the work the normal flow of the river will be discharged around one end of the concrete portion of the dam. This will be accomplished by the construction of a steel piling cofferdam approximately 600 feet in length.

The principal structures on the first 45 miles of the Interstate canal have been constructed under two schedules. The work under schedule No. 1, which included the reenforced concrete flume and flood-water intake at Cottonwood Wash, near Whalen, Wyo., was completed early in the season of 1906, as the structure was needed during the irrigation season of that year. Schedule No. 2 included the construction of seven 66-foot and three 60-foot span combination highway bridges, two reenforced concrete flumes, reenforced concrete siphon, four overflow crests with aprons, two reenforced concrete box culverts, and one reenforced concrete circular culvert. The work under this schedule was completed during the season of 1907. There was also built by force account on this section of canal twenty-three concrete lateral head gates, two concrete box culverts, vitrified pipe underdrains, two reenforced concrete check gates, two wooden check gates with concrete floors, one set sluice gates, one set bridge abutments, one slope wall, and one tile drain 1,500 feet in length, as

well as a number of minor structures. The concrete structures of the distribution system under the second 50 miles of the canal are now under construction by force account.

INCIDENTAL OPERATIONS.

In order to facilitate the transportation of materials and supplies to the Pathfinder dam it was necessary to build a pile bridge across North Platte River near Casper, Wyo. This bridge was completed in October, 1905, and has been in use since that time. The administration and supervision of the work has also required the erection of cottages, warehouses, and other buildings at Wyncote, Wyo., Mitchell, Nebr., and at the Pathfinder dam site in Wyoming.

IRRIGABLE LANDS.

The following table shows the distribution of the irrigable lands, including lands under the proposed additional 50 miles, Interstate canal:

Lands included in North Platte project, Interstate Canal.

	Acres.	Per cent.		Acres.	Per cent.
GENERAL.			IRRIGABLE LAND—cont'd.		
Total	382,573		Farmers canal	75,771	26.8
Private	212,173	55.4	Other canals in Nebraska	51,148	18.2
Public	170,400	44.5	Subscribed under interstate only	10,378	3.68
Irrigable	281,918	78.6	Not subscribed under interstate only	24,622	8.74
Nonirrigable	100,655	21.4	Public irrigable	119,900	42.5
PRIVATE LAND.			Private irrigable	162,018	57.5
Total	212,173		NONIRRIGABLE LAND.		
Irrigable	162,018	76.4	Total	100,655	
Nonirrigable	50,155	23.6	Under interstate only	48,000	47.7
PUBLIC LAND.			Under Whalen Falls canal	6,407	6.4
Total	170,400		Under other canals in Wyoming	7,800	7.7
Irrigable	119,900	69.0	Under Farmers canal	20,000	19.9
Nonirrigable	50,500	31.0	Under other canals in Nebraska	18,448	18.3
IRRIGABLE LAND.			Subscribed under interstate only	3,982	4.2
Total	201,918		Not subscribed under interstate	30,414	30.2
Irrigable, interstate only, in Nebraska	129,106	45.8	Public	50,500	50.2
Irrigable,, interstate only, in Wyoming	11,294	4.0	Private	50,155	49.8
Whalen Falls canal permit	13,300	4.7			
Other canals in Wyoming	1,299	.5			

EXPENDITURES.

The expenditures on the North Platte project are summarized in the following table:

Expenditures, according to physical features, on North Platte project to June 30, 1907.

Features.	Engineering and administration.	Building.
Incidental structures:		
Pathfinder dam, North Platte pile bridge	$221.52	$3,659.86
Interstate canal, temporary diversion dam	1,904.98	4,569.56
Interstate canal, temporary first 45 miles	3,531.73	6,559.85
Pathfinder, offices, etc., Pathfinder, Wyo	760.03	9,185.18
Interstate canal, offices, etc., Wyncote and Mitchell	1,232.54	14,174.46
Interstate canal, offices, etc., second 50 miles		3,035.56
Interstate canal, offices, etc., first lateral district		1,283.76
Interstate canal, offices, etc., second lateral district		2,152.36

Expenditures, according to physical features, on North Platte project to June 30, 1907—Continued.

Features.	Engineering and administration.	Building.
Irrigation structures:		
Pathfinder reservoir, land submerged	$1,461.55	$77,935.00
Pathfinder dam and spillway	42,047.87	178,652.46
Pathfinder outlet tunnel	3,241.17	35,228.10
Pathfinder dike	1,007.15	300.00
Pathfinder gates	443.18	102.96
Interstate, lands for canal	1,519.74	3,873.75
Interstate, diversion dam	4,856.30	30,855.69
Interstate, excavation canal first 45 miles	61,889.41	545,897.30
Interstate, structures first 45 miles	19,995.76	228,607.50
Interstate, excavation second 50 miles	54,539.08	511,720.57
Interstate, structures second 50 miles	929.76	4,464.95
Interstate, preliminary third 50 miles	6,655.82	.....
Interstate, first lateral distributing system	27,490.55	91,784.11
Interstate, second lateral distributing system	12,634.21	4,765.25
Irrigable lands: Farm unit subdivision and soil examination	3,955.04	.....
Topography	17,122.72	.....
Examination Sweetwater reservoir	10,100.00	.....
Examination Goshen Hole, Fort Laramie, and Alcova-Casper canals	17,225.23	.....
Pathfinder administration	20,578.57	.....
Interstate administration	65,151.88	.....
Maintenance and operation	4,447.40	.....
Total	384,943.19	1,767,808.23
Grand total	2,152,751.42	

Total expenditures, according to purpose and nature, on North Platte project to June 30, 1907.

[Total, $2,152,751.42.]

	Services.	Traveling.	Subsistence.	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination	$27,599.88	$4,080.97	$4,996.67	$7,825.91	$0.40	$2,361.56	$43.51	$1,261.95	.....
Survey	59,988.70	5,573.85	9,753.04	15,588.57	50.36	6,302.54	224.66	6,107.44	.....
Design	11,605.62	731.35	186.63	234.66	1.16	247.44	107.09	34.99	$353.38
Subdivision	4,779.88	350.15	37.25	85.65	.....	227.15	44.66	.75	.....
Building:									
Rights and property	2,916.77	1,018.11	87.30	14.00	4.00	82,917.55	4.00	60.47	.....
Building	171,914.18	6,183.61	24,314.86	23,403.08	49,177.92	24,330.39	1,231.17	20,466.06	1,513,926.11
Maintenance	4,017.90	19.34	191.72	566.07	131.54	357.96	.....	171.95	.....
Operation	2,523.47	19.05	15.20	7.30	.....	166.05	.....	2.62	.....
Administration	39,233.66	4,035.11	244.14	1,859.16	.....	4,558.96	1,872.57	.25	.....

SECONDARY PROJECTS.

The Fort Laramie canal is situated on the south side of North Platte River. The irrigable area is estimated at 50,000 acres, equally divided between the States of Nebraska and Wyoming. The soil, climate, crops, etc., are similar to those for the Interstate canal, and the proportion of public and private land about the same. The canal will be about 120 miles in length and will be served by the same storage reservoir diversion dam as the Interstate canal. The duty of water, land-office districts, etc., will be the same for each.

The Goshen Hole canal is on the south side of North Platte River, from which it will be diverted at a point near Guernsey, Wyo. The irrigable area under this canal is estimated at 100,000 to 150,000 acres, principally in Wyoming. The soil, elevation, climate, crops, etc., are the same as for the Interstate canal. About 60 per cent of

the land under this canal is public. The total length of the canal will be about 140 miles. The source of supply, duty of water, land-office districts, etc., will be the same as for the Interstate canal.

The construction of various canals in the vicinity of Alcova, Casper, and Douglas, Wyo., has been considered. Owing to the difficulties of construction, and the large percentage of private land, the building of these canals has been indefinitely postponed.

Examinations of these secondary projects were begun in the spring of 1903. Since that time preliminary surveys have been made for the Goshen Hole canal and testing has been done for the foundation of a diversion dam near Whalen, Wyo.

It is estimated that the construction of the Fort Laramie canal will involve the expenditure of approximately $1,500,000, and of the Goshen Hole canal more than $6,000,000.

NEVADA.

TRUCKEE-CARSON PROJECT.

GENERAL DESCRIPTION.

The principal facts relating to the Truckee-Carson project are summarized below:

Summary of principal data relating to the Truckee-Carson project.

Counties: Churchill, Lyon, and Storey.
Latitude: 38° 48′ to 40° 15′.
Longitude: 118° 20′ to 119° 35′.
Townships: 16 to 24 north, range 21 to 31 east, Mount Diablo meridian.
Irrigable area of first unit: 200,000 acres.
Watershed area: 3,450 square miles.
Average rainfall on irrigable area: 4 inches.
Range of temperature: Maximum, 100°; minimum, —12°; mean, 48°.
Average elevation: 3,950 feet.
Principal products: Alfalfa, cereals, vegetables, fruit.
Nearest railroad: Southern Pacific.
Nearest stations: Fallon, Hazen, Wadsworth, distance 0 to 20 miles.
Principal markets: San Francisco, Salt Lake City, local mines.
Proportion of public land: 70 per cent.
Farm unit: 80 acres.
Character of soil: Sandy loam, clay loam, volcanic ash.
Value of irrigated land: $50 to $100 per acre.
Kind of headworks: 2 concrete diversion dams.
Reservoir areas: Lake Tahoe, 193 square miles; Alkali Flat, 8,000 acres; Lower Carson, 11,000 acres.
Capacity of reservoirs: Lake Tahoe, 200,000 acre-feet; Alkali Flat, 220,000 acre-feet; Lower Carson, 286,500 acre-feet.
Duty of water: Mean, 2½ acre-feet per acre per annum.

In the following table are listed the contracts entered into for building work on the Truckee-Carson project. This list includes all contracts for excavation, embankment, masonry, and erection of structures, but does not include material, such as cement, steel, timber, etc.

Contracts for building work on Truckee-Carson project to June 30, 1907.

No. of contract.	Contractor.	Feature.	Estimated total value.[a]	Payments to June 30, 1907.	Per cent paid.
1	E. B. & A. L. Stone Co.	Main canal, division 3	$250,700	$339,118.80	100
2	C. A. Warren & Co.	Main canal, division 1	303,417	476,001.96	99
3	....do	Main canal, division 2	439,670	484,941.29	100
14	Clarence W. Swain[b]	Bridges, distributive canals	4,288	3,826.11	89
15	Pacific Coast Construction Co.	Excavation, distributive canals.	195,887	254,777.26	100
16	San Francisco Construction Co.	Structures, distributive canals.	43,220	60,997.50	92
29	....do	Ditches, divisions 1, 2, and 6.	129,587	129,270.29	99
30	Pacific Coast Construction Co.	Ditches, division 5	43,550	43,436.31	100
31	Utah Construction Co.	Ditches, divisions 3 and 4	117,737	98,239.27	100
57	Edward Malley[c]	Lake Tahoe	32,200		
	Thos. Sayers	Ditches, district 5	15,150	17,313.71	100

[a] For a discussion of advance estimates and final costs see Fifth Annual Report, p. 51.
[b] Contractor in default. Work completed by force account.
[c] Contract canceled by mutual consent.

WORK IN PROGRESS.

Since the date of the last annual report construction of canals and structures has been carried on by force account in districts 3, 4, 5, and 7. During this time also a contract for about 100,000 cubic yards of excavation in district 5 was let to Thomas Sayers at 15 cents per cubic yard. This contract was completed in June of the present year.

The percentages of district systems constructed are as follows: District 1, 95 per cent; district 2, 85 per cent; district 3, 62 per cent; district 4, 38 per cent; district 5, 73 per cent; district 7, 62 per cent.

Canals have been completed to command and deliver water to about 140,000 acres of land, and canals and structures are ready to deliver water to about 80,000 acres of irrigable land.

The total number of cubic yards of material excavated to date on the project are: Earth, 8,542,474; loose rock, 83,831; solid rock, 456,261. The number of miles of canals excavated to date are: Class 1, 104 miles; class 2, 73.2 miles; class 3, 416.5 miles.

The work of extending the lateral systems in the several districts will be continued during the next year.

OPERATION.

The operation of the Truckee-Carson canals began with the irrigating season of 1906. Water was first turned into the canals taking water from the Carson on February 5, 1906, and as high as 500 cubic feet per second were diverted from that stream during the height of the irrigating season. The Main Lower Truckee canal was used to irrigate small acreages only, owing to the unfinished condition of the take outs and laterals, but commencing on August 10, when the Carson fell below the needs of the farmers, water was carried from the Truckee to the Carson to supply water for irrigation along the Carson canals.

Water was kept in the canals until about December 1, or nearly four weeks longer than ordinarily would be done. This was done in order to assist the Southern Pacific Company in putting in bridge abutments at their crossing of Carson River. During the remainder of the winter small amounts of water were run in part of the canals for stock water and for domestic use in part of the irrigated district.

Repair work was pursued throughout the winter. The mild winters permit work at almost any time, and there is little reason for delay of work on account of bad weather.

Water was turned into the canals of the project on February 1, 1907. Priming was carried on and repair work was being prosecuted vigorously during that month.

The precipitation on the Sierra Nevada during the winter months was heavy. There are no snowfall stations in the high mountains which can be reached, except along the line of the Southern Pacific Railroad west of Truckee, Cal. The station at Summit has been equipped by the Weather Bureau as a snowfall station, and the records received from there during the past two years have proven valuable and seem to be an indication of conditions on both Truckee and Carson watersheds. The snow during the season of 1906–7 was extraordinary—probably exceeding any year since white men have been acquainted with the mountains. On February 1 the depth at Summit was 137 inches. This depth gradually decreased until on February 20 it was 82 inches. Storms then commenced and the depth rapidly

increased until on March 13 there were 198 inches of snow, including about 9 feet of loose new snow.

The large amount of loose snow was in excellent condition to be rapidly melted by warm wind or rain. On March 16 and 17 warm rain in the Sierras caused the greatest flood ever known in parts of California and Nevada. Truckee River has never been subject to sudden and violent floods, but on March 17 the stream suddenly commenced to rise, and on the 19th probably 25,000 cubic feet per second passed the diverting dam above Derby. This flood brought down a great quantity of brush, logs, and trees, which massed in front of the gates and backed water above the dam 3 feet higher than the supposed maximum point. This large amount of water passed through the gates at a tremendous velocity and eroded the paving below the dam. The back-wash cut laterally below the concrete buttress walls and finally cut into the canal. At no time, however, was there danger to the main structure. No concrete was damaged, except a few yards broken off the high-water spillway on the canal. The total damage to the dam and canal consisted of washing out the riprap and earthwork. Three days' time was required to make repairs sufficient to allow water to pass down the Truckee canal.

Floods in the Truckee generally reach the diverting dam twenty-four to seventy-two hours ahead of floods in the Carson at the Carson dam. The heavy rains had cut off all communication with the headwaters of Carson River, but as the two streams behave very similarly, protective work along the Carson was commenced on the morning of the 18th. The river commenced to rise at the Carson dam on the 20th, about 2 p. m. The water rose rapidly until about midnight, when about 24,000 cubic feet per second were passing. All attempts at protection proved fruitless, however, and serious damage resulted to earthwork in many places.

The following table will show the recorded severe floods in the Carson and Truckee rivers:

Floods in Truckee and Carson rivers, Nevada.

Carson River at Empire.		Truckee River at Vista.	
Date.	Cubic feet per second.	Date.	Cubic feet per second.
May 27, 1890	6,200	May 28, 1890	7,500
May 18, 1901	3,791	May 3–12, 1900	1,477
May 30, 1902	1,712	February 22 and May 11, 1901	4,213
May 15, 1903	2,065	April 7, 1902	4,336
February 25, 1904	3,250	March 31, 1903	5,650
May 26, 1904	3,150	May 6, 1903	3,055
May 19, 1905	1,430	April 15, 1904	8,940
June 18, 1906	(?) 4,000	April 27, 1905	1,860
March 20, 1907	(?) 24,000	June 18, 1906	(?) 9,000
June 8, 1907	(?) 5,000	March 19, 1907	(?) 25,000
		June 4, 1907	(?) 9,000

The maximum discharge of the river during the extraordinary flood of March 19, 1907, was estimated at 25,000 second-feet. This was the greatest flood known in the history of the river, and there is no other record of as great a discharge. The greatest measured discharge occurred on April 16, 1904, amounting to 7,480 second-feet, and the rating table indicates a maximum for that year of about 9,000 second-feet. This was probably the greatest until the flood of 1907.

At the maximum flood of the Carson the flow was at the rate of 24.4 cubic feet per second per square mile of drainage basin, and for the Truckee 16.4 feet.

The damage to the Carson canals was confined almost entirely to earthwork. No important concrete or timber structures were damaged. At the Carson dam water cut through the levees on the north bank and across the "T" line canal, which supplies district No. 2. On the south side the levees were broken and the south bank of the "V" line broken. A large amount of water, probably 2,000 cubic feet per second, flowed down the canal, and to prevent damage to the power-house foundation, 6 miles below the dam, the canal was cut about 400 feet above that structure. Two breaks also occurred in the clay banks about 2 miles below the Carson dam. These cuts caused serious washing in the canal, and about 3,600 feet of new canal were constructed before the canal was placed in commission.

The channel of Old Carson River, corrected to carry 5,000 cubic feet per second, was restricted by a new fill and bridge falsework of the Southern Pacific Railroad Company's Fallon branch, where that railroad crosses Carson River 2 miles from Fallon. This backed water up 2.1 feet and caused the levees at the head of New River to break. The north bank of the "S" line canal had been strengthened on the 18th, 19th, and 20th in anticipation of a break in the upper line of levees. The new earth, however, could not stand the pressure, and finally the north bank broke. The south bank was then cut and the old channel of New River was filled. This flood cut across the lateral system in districts Nos. 1 and 5 and caused much damage.

The levees at the head of South Fork were overtopped, but the "L" line canal banks held the flood, and little damage was caused here.

The entire damage from this flood amounted to approximately $60,000.

Repairs to the canals were pushed with a large force of men and teams. Water was started down the Truckee canal on April 1 and down the "T" line canal to supply district 2 on April 1. The heavy work caused by the washouts on the "V" line canal was not completed until May 1. On that date water was started down the canal. The new fills across the two cuts in joint clay 2 miles below the dam gave way and water was turned out on May 2. Several unsuccessful attempts were made to repair these breaks, and at last a new canal was dug around them. Water was finally started down the canal on May 18. On May 20 delivery was commenced to the majority of lands in districts 1 and 3.

Aside from the damage and inconvenience caused by the spring flood of March, the canals of the project have been operated successfully without serious mishap. Very little extension was made in the length of lines operated in districts 1 and 2. In district 3 one lateral was opened up, supplying water to perhaps a dozen homesteaders, and during the early spring months a part of district 5 was placed under operation, delivering water to the lands holding vested water rights east of Fallon, and gradually extending the lateral system to cover the homestead lands in that district.

The lateral system in the lower part of district 7, that is to say, that part of the district lying south of Hazen, was placed under oper-

ation and water was delivered to all lands ready to receive same. The upper part of district 7 has not been completed, but a number of farmers in this district built their own laterals to the Government turnouts and received water during the season. The following table gives the approximate length of canals, laterals, and drains in operation during the season of 1907:

Canals operated in 1907.

	Miles.
Main canals	73
Primary laterals	45
Laterals	58
Drains	75
Total mileage	251

The greatest expense in the maintenance of the system has been repairs to earthwork, resulting from washing of banks of canals, from breaks caused by gophers, and from overtopping of banks in low places where the wind has lowered the ground. These expenses will become less as the canals are better seasoned and as the earth banks become covered with vegetation, which will prevent erosion by wind or by water.

During the season of 1906 the most expensive item perhaps was the repairing of damage caused by gophers. Systematic attempts were made to kill these gophers during the winter and spring. Stretches of ditch where breaks were frequent last year have been successfully operated this year without any serious breaks occurring. This was due entirely to the killing off of the gophers by poison and by traps. It is thought that by constant efforts along this line it will be possible to keep down the gopher nuisance.

The operation force upon the project for the season of 1907 consisted of 1 engineer in charge, 1 recorder in the office, 1 bookkeeper and clerk, 2 gate tenders, and 10 ditch tenders. As the canals are extended more ditch tenders will have to be employed, but it is thought that the cost of delivering water will be proportionately decreased each year in the future.

Careful records are kept of the amounts of water delivered to each farmer on the project. Records on file in the office show at any time the amounts delivered to each particular tract of land, and as methods of farming become more settled the amounts of water will be reduced to the maximum of 3 acre-feet per annum. Water will then be delivered and measured and the cost of maintenance and operation assessed in proportion to the amount of water actually used.

The following table shows the amount of land actually irrigated and cultivated on this project during the season of 1906:

Crops grown on Truckee-Carson project in 1906.

Product.	Acres.	Tons per acre.	Product.	Acres.	Tons per acre.
Pasture	10,000	.....	Sorghum	2	4.00
Wild hay	1,200	1.50	Kafir corn	7	4.00
Alfalfa	6,800	1.40	Milo maize	2	4.00
Millet	15	1.00	Potatoes	67	8.00
Wheat	460	.65	Garden	72	.....
Barley	1,400	.55	Orchard	32	.....
Oats	383	.50	Grain and alfalfa hay	329	1.82
Rye	3	.50			
Corn	12	.50	Total	20,794	.....

The population was 674, and the number of ranches 108. The above census was estimated for only one crop of alfalfa.

An approximate estimate of the value of these crops shows the value to be about $250,000, or at the rate of $12 per acre. A large amount of this land is pasture land, as shown in the table, producing a minimum amount of returns, and for this reason the average value of crops per acre is small.

SETTLEMENT OF THE PROJECT.

On July 31, 1907, there were 316 homestead filings on land embraced within the limits of the Truckee-Carson project, a majority of which are believed to be made by bona fide settlers. These filings cover 30,673 acres, of which 16,227 are irrigable by gravity, and there are besides this amount 11,215 acres in homestead filings in which the irrigable part has not been measured.

Settlement of the project is progressing slowly but satisfactorily. Inquiries have been received from a large number of people throughout the country and a large influx of settlers is expected during the spring of 1908.

The subdivision of land under the Truckee-Carson project has been carried on until now there are 582 farm units established on Government land and 137 farm units on railroad land, aggregating 52,694 acres of public land and 14,032 acres of railroad land, of which 32,076 acres of the public land and 10,129 acres of railroad land are irrigable.

There are besides this, 29,696 acres of land in private ownership irrigable from the ditches already constructed, of which 24,641 acres can be watered by gravity.

Further extensions of the project will cover 108,575 acres of public land and 25,519 acres of railroad land and land in private ownership, the irrigable part of which has not been determined, but if the same percentage of irrigable land holds in this as was found in the part for which the irrigable acreage has been determined, it will bring the total amount of irrigable land within the project, in round numbers, close to 200,000 acres.

EXPENDITURES.

The expenditures on the Truckee-Carson project are summarized in the following tables:

Expenditures, according to physical features, on Truckee-Carson project to June 30, 1907.

Features.	Engineering and administration.	Building.
Incidental structures:		
Telephone system, 63 miles	$4,717.72	$29,518.60
Permanent buildings	4,803.16	30,052.87
Irrigation structures:		
Main Truckee canal and structures	210,459.97	1,316,100.83
Main distribution system	55,584.84	347,692.19
Carson dam	11,309.52	70,762.51
Power house drop	8,506.39	53,224.27
Old River channel straightening	15,848.93	99,166.00
Lateral and drainage system	137,926.32	862,265.02
Land purchases		51,108.99
Upper Truckee canal location	6,178.31	

Expenditures, according to physical features, on Truckee-Carson project to June 30, 1907—Continued.

Features.	Engineering and administration.	Building.
Irrigation structures—Continued.		
Lovelock canal, preliminary location	$11,573.22	
Ppramid Lake canal, preliminary location	2,254.66	
Lake Tahoe regulating works	2,156.71	
Carson Lake drain, location	3,665.74	
Section lines, Carson Sink Valley	10,294.50	
Examination:		
Project as a whole	16,892.88	
Storage sites	34,706.68	
Topographic surveys	54,808.83	
Maintenance of irrigation works	46,130.08	
Maintenance, flood expense	50,284.53	
Operation of irrigation works	25,140.08	
Inventories		$73,374.07
Total	713,243.07	2,933,265.35
Grand total	3,646,508.42	

Total expenditures, according to purpose and nature, on Truckee-Carson project to June 30, 1907.

[Total, $3,646,508.42.]

	Services.	Traveling.	Subsistence.	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination.	$15,558.45	$1,209.95	$1,932.70	$1,434.50	$8.54	$3,075.91	$157.54	$568.75	$285.55
Survey	166,135.65	8,516.05	21,632.75	14,758.26	229.96	36,446.48	1,189.36	11,792.63	.....
Design	38,875.54	2,431.12	2,851.23	3,166.80	28.21	8,649.13	320.37	972.92	179.92
Subdivision	18,649.37	971.11	1,018.61	1,374.76	2.88	2,767.51	161.10	313.67	.....
Building:									
Rights and property	2,756.30	225.90	70.30	.....	8,457.00	14,619.78	.....	13.60	.....
Building	437,761.42	4,325.26	89,515.08	50,276.35	202,855.15	46,475.20	153.14	126,299.09	2,004,273.52
Maintenance	41,442.14	227.95	3,611.25	4,350.70	110.83	1,602.76	.....	4,002.57	50.00
Operation	17,287.74	236.43	101.42	585.24	151.61	127.83	.....	166.73	.....
Administration	144,681.22	11,207.97	11,111.88	14,965.82	281.16	26,697.62	1,971.43	5,791.75	.....

PROPOSED WALKER RIVER PROJECT.

A description of this project may be found in the Fifth Annual Report, pages 207–208. Nothing has been done during the fiscal year ended June 30, 1907, and no additional expenses in connection with it have been incurred. The table given on page 208 of the Fifth Annual Report shows the total expenditures to be $12,220.29.

NEW MEXICO.

CARLSBAD PROJECT.

GENERAL STATEMENT.

The general features of the Carlsbad project are summarized below:

Summary of principal data relating to Carlsbad project.

County: Eddy.
Townships: 21 south, ranges 26 and 27 east; township 22 south, ranges 26, 27, and 28 east; township 23 south, ranges 27 and 28 east; township 24 south, range 28 east, New Mexico principal meridian.
Latitude: 32°.
Longitude: 104°.
Altitude: 3,100 feet.
Railway connections: Eastern Railway of New Mexico, of Santa Fe System.
Principal markets: Carlsbad, Fort Worth, Denver, and Chicago.
Land office for district: Roswell, N. Mex.
Irrigable area: 20,000 acres, all private. Extends for a distance of 5 miles on the east side of Pecos River and for a distance of 16 miles on the west side.
Character of soil: Fertile alluvium.
Range of temperature: Maximum, 110°; minimum, 0°.
Average rainfall: 14.02 inches.
Size of farm unit: 160 acres.
Value of irrigated lands: $50 to $150 per acre.
Principal products: Alfalfa, apples, corn, cotton, grapes, melons, peaches, and vegetables.
Duty of water: 3 acre-feet per acre per annum.
Watershed area: 22,000 square miles.
Average rainfall: 15 inches.
Average annual discharge: 150,000 acre-feet.
Storage reservoir: Area, 3,240 acres; capacity, 15,170 acre-feet.
Storage dams: One, earth and rock fill; 1,686 feet long and 52 feet high.
Diversion dam: One, earth and rock fill, with concrete core wall, 1,025 feet long, 50 feet high.
Main canals: Main, 3 miles long, 45-foot bed; east side, 5¼ miles long, 15-foot bed; southern canal, 7 miles, 30-foot bed, 10 miles, 25-foot bed, 3 miles, 15-foot bed; Black River canal, 6 miles long, 5-foot bed. Lateral canals, 112 miles, 3-foot bed.

The area embraced by the Carlsbad project is that selected as the best portions of the area comprised in the system of the Pecos Irrigation Company. This system was opened in 1890, and about 13,000 of the 20,000 acres selected by the United States Reclamation Service had been in cultivation for years, until they were left without water by the destruction of the diversion dam by flood, in October, 1904. The resources of the irrigation company were insufficient to rebuild the dam, and this valuable cultivated area, with its orchards, vineyards, and alfalfa fields, was in imminent danger of going back to the desert condition from which it had been reclaimed. With this calamity confronting them the people appealed to the Reclamation Service for help. The only way in which help could be given lay in

purchasing the wrecked plant of the Pecos Irrigation Company and in rebuilding it into a permanent practical system.

With this end in view, surveys and investigations were begun in January, 1905. A consulting board met at Carlsbad on August 28, 1905, and after a four days' session recommended that $600,000 of the reclamation fund be allotted for the purchase and repair of the system. For the purchase price, $150,000 was specified, and the amount necessary for construction was estimated to be $450,000.

It was recommended that the Government should undertake all construction by force account, with the exception of the Avalon dam, which it was decided should be built by contract, the Government furnishing the cement and steel sheet piling for this dam. The Pecos Irrigation Company agreed to accept the purchase price named.

April 12, 1906, was the date set for opening bids for construction of the Avalon dam. As no bids were received, authority was given on April 18, 1906, for the construction of this feature by the Government by force account.

The work to be done on this project consisted in making a new gate structure and other improvements at Lake McMillan, the storage reservoir; rebuilding the Avalon storage and diversion dam as a substantial structure, and enlarging the capacity of the spillways; repairing and, in some cases, rebuilding the entire system of canals and laterals; constructing head gates, storm gates, and lateral gates of concrete for the canal system; repairing and reenforcing the concrete flume carrying the main canal across Pecos River; constructing a reenforced concrete inverted siphon carrying the main canal under the bed of Dark Canyon, and reconstructing the Black River canal. The Black River canal forms a separate system and takes water by direct diversion from Black River for the irrigation of about 1,000 acres of the 20,000 under this project.

AVALON DAM.

This dam is being built at the site of the old dam, at the head of the main canal system, 6 miles above Carlsbad. A portion of the old dam was left standing and has been utilized in the new structure. The new dam is an earth and rock fill dam, 50 feet high above river bed, and 1,025 feet long. For its entire length it has a core wall founded on bed rock and extending to the top of the dam. From bed rock to the surface of water in the canal, which is 24 feet below dam crest, this core wall consists partly of rubble concrete and partly of heavy steel interlocking channel-bar sheet piling, the latter being driven to bed rock in such manner as to form a core wall in that part of the old dam where very deep trenching would be necessary in order to construct a concrete core wall on bed rock. From the top of this steel and concrete core wall to the crest of the dam there is a vertical diaphragm of reenforced concrete, 12 inches thick at its bottom, 8 inches at its top, and 24 feet high. Bed rock is from 10 to 14 feet below the low-water level of the unobstructed river. The downstream side of the dam is a rock fill and the upstream side earth fill, well paved with large rock. There are three spillways, two of which have been considerably enlarged, the material thus removed entering into the construction of the dam.

Preparatory work began at the dam May 1, 1906; actual construction may be said to have begun June 1. It progressed practically simultaneously from both banks of the river. After construction had begun, two important changes were made in the design; it was found that the lower strata of the formation through which it had been designed to use the steel sheet piling were composed of such large bowlders as to make the driving more difficult and expensive than had been anticipated, and on the west bank of the river it was found advisable to substitute trenching, and a concrete core wall on bed rock, where the use of steel sheet piling had originally been planned.

This trenching for the core wall disclosed at the west side of the dam a stratum of gravel, which was so pervious that it was decided to build a concrete cut-off wall through it. There being strata of solid rock above and below the gravel, this was done by tunneling in the gravel seam, lining one side of the tunnel with concrete, and refilling and puddling the tunnel. The wall thus put in is 129 feet long, averages 8 feet high, and 6 inches thick; it runs outward upstream at an angle of 60° with the core wall from a point 30 feet from the west end of the core wall.

The river section of the core wall was built to such dimensions as to serve during construction as an overflow weir. It was built up in steps, confining the flow of the river to its middle portion, the sides of this middle gap being raised alternately. On March 25 the gap had been raised in this manner until the flow of the river was diverted into the canal. The earth and rock fill were kept up with the core wall as closely as the flow over the dam would allow, and the riprap on the earth face kept up in advance of the rise of the water.

The work has progressed smoothly and without mishap. The dam was 88 per cent completed June 30, 1907.

CANALS.

MAIN CANAL.

The main canals purchased from the Pecos Irrigation Company had no upper banks, and the width of the water surface varied from 50 to 1,000 feet, and had even greater widths in crossing flat ravines. They were also badly out of grade, so that the water stood in pools or rushed over shoals. The increased loss of water by evaporation and seepage due to this construction was enormous, and all canals have been brought to uniform width and grade by the Reclamation Service. Of the 22 miles of the main canal 15 miles are completed, and about 60 per cent of the remaining 7 miles is completed. Temporary discontinuance of this work was necessitated by the turning of water into the canals for the irrigation season of 1907, before the lower end was completed. There was, however, comparatively little to be done along this section, and it will be a matter of a short time to complete it when the water is turned out of the canals.

EAST SIDE CANAL.

Reconstruction, as described above, was completed over the 5⅓ miles of the East Side canal during October and November, 1906.

EXP[illegible]NAL.

e Carlsbad p[illegible]

This was the first featu[illegible]g tables: [illegible]t completed, it having been begun in March, 1906, and [illegible] on May 22, 1906. About 6 miles of canal were reconst*usical features, o*[illegible]ncrete lining was placed at the upper end for a len[illegible] *30, 1907.* [illegible] The old canal was so leaky that it delivered only [illegible]ge of the water turned into it from the river. The [illegible] w been in use for the better part of two seasons an[illegible] absolutely water-tight.

[illegible]es, bunk-houses, etc.[illegible]

BLACK RIVE[illegible] I.

[illegible]

There are times when the dema[illegible]nder the Black River canal exceeds the low-water flow [illegible] \ ditch is being constructed from the lower end of the [illegible]ntering Black River just above the dam and opposite th[illegible]e Black River ditch, to serve the double purpose of supp[illegible]rtage in emergency and of acting as a regulator for the l[illegible]e main canal. Part of this ditch is through gypsum soi[illegible]e lining will be required in the same manner as the Bla[illegible]al. All but the section requiring lining has already been [illegible], and it is expected that the ditch will be carried to com[illegible]ing the latter part of 1907.

LATERAL-CANAL I[illegible]

The lateral canals as last used by the *nature, on* [illegible]gation Company were generally in bad condition, and a [illegible]unt of repairing was necessary. More of this repair work will be necessary during the coming winter. In some cases the ditches will require enlarging and in other instances rebuilding.

STRUCTURES.

AVALON HEAD GATES.

The Avalon head gate, a reenforced concrete shell with earth and rock loading is completed. The following large structures of reenforced concrete are completed: East canal head gate, main canal spill gate, main canal check gate above the Pecos River flume, Dark Canyon check gate, Dark Canyon spill gate. Plain concrete spillways (paved and grouted) have been built to relieve the canal of flood waters, four where Hackberry Draw is crossed, and one above the Dark Canyon check gate. It is intended ultimately to replace all of the old wooden lateral head gates, division boxes, and sublateral head gates with concrete structures. Eight main lateral head gates required rebuilding before water was turned in, and these have been built of concrete. The remainder of the main lateral head gates will be replaced during the winter of 1907 by concrete structures.

PECOS RIVER FLUME.

The main canal is carried o[illegible] Pecos River by a concrete aqueduct of four arches of 1[illegible] built by the Pecos Irrigation

Company in the winter of 1903. Itam May y damaged by the flood of 1904; the foundation undegun June 1. iers was undermined, and considerable settlement andanks of the rivted. This bad foundation has been excavated downnges were maderial and a heavy concrete foundation, reenforced w the formation , built up to the bottom of the pier. The other pie el sheet piling w increased bearing surface. In the past trouble wae driving more diffnaking a water-tight bond between the terreplain on the west bar masonry at either end of the structure. The embante trenching, and, treacherous sand, and wash-outs occurred several t steel sheet pilito fortify the structure against this, the wing walls the core wall ave been extended farther out beyond the ends and avel, which wast of concrete from bedrock up, instead of being fou cut-off wall thn sheet piles as formerly. The cracks and breaks h below the gra orked on, and they appear to be well closed and wat ing one side of present time.

he tunnel. Th

h, and 6 inches ON SIPHON.

th the core wal

Below Pecos Ri ll. t drainage channel crossed by the main canal is that o of the core on. Formerly the water was carried across in a large s ruction as formed by an earth dam across the lower end of the ca e flow of th ut one-fourth of the water carried by the canal was lost being raise colation. The canyon being subject to heavy floods, it w s manner un to maintain two spillways in the embankment. Freq earth and ro occurred at one of these spillways. To avoid these sour w over the the canal has been double-banked and brought to a unif in adva on at this point and a gap 400 feet wide left at the deepest point of the canyon for storm water to pass through. The canal water is conveyed under this gap by an inverted siphon of reinforced concrete, 6 feet in inner diameter and 400 feet long. The pressure head for this siphon is 2.55 feet, which was obtained by carefully regrading the canal and concentrating the surplus fall at this point. Water was first sent through the siphon on April 2, 1907. After it had been in constant service for four months there arose an opportunity to turn the water out of it. An examination made at that time found the siphon in perfect condition in every particular.

M'MILLAN HEAD GATES.

A head-gate structure of reenforced concrete, very similar in design to the Avalon head gates already constructed, is contemplated for construction during the latter part of 1907. A considerable part of the preparatory work, consisting of building a storehouse and storing the greater part of the cement required, has already been done.

AVALON SPILL GATES.

Just below the Avalon dam and above the head gate is a spillway cut through solid limestone, recently enlarged to a width of 250 feet. This will be closed by a reenforced concrete structure containing quick-acting emergency gates of special design. It is hoped that this will be completed before the end of the year.

EXPENDITURES.

The expenditures on the Carlsbad project to June 30, 1907, are summarized in the following tables:

Expenditures, according to physical features, on Carlsbad project to June 30, 1907.

Features.	Engineering and administration.	Building.
Incidental structures, office repairs, warehouses, bunk-houses, etc.	$725.04	$10,139.45
Irrigation structures:		
Pecos Irrigation Co.'s system purchase	434.55	150,000.00
McMillan headgates	160.83	506.30
Avalon dam	11,970.95	121,408.53
Main and Southern canals	5,744.92	61,363.09
East side canal	181.53	3,047.43
Black River cut-off	293.52	715.41
Black River canal	902.07	6,143.99
Pecos River flume	1,405.57	13,918.30
Dark Canyon siphon	1,472.91	17,888.46
Canal structures	1,081.15	9,460.12
Lateral canals	.....	2,325.58
Inventory	.....	35,440.82
Irrigable lands:		
Farm unit subdivision and soil examination	8,597.19	.....
Water Users' Association	3.00	.....
Examination of the project as a whole	19,597.29	.....
Administration of the project as a whole	20,341.58	.....
Total	72,912.10	432,357.48
Grand total	505,269.58	

Total expenditures, according to purpose and nature, on Carlsbad project to June 30, 1907.

[Total, $505,269.58.]

	Services.	Traveling.	Subsistence.	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination	$8,563.58	$1,740.73	$966.31	$230.23	$0.50	$461.15	$89.71	$220.74	$129.86
Survey	9,345.95	958.99	2,414.86	2,543.27	11.31	925.57	17.42	810.74	.....
Design	1,664.06	87.43	4.94	8.06	.....	19.42	20.23	.....	67.62
Subdivision	422.98	83.83	140.25	9.58	.....	12.11	3.83	3.00	.....
Building:									
Rights and property	1,011.35	206.34	.....	.....	.....	149,526.39	.....	.....	.....
Building	206,954.28	931.57	6,637.04	21,775.06	39,033.70	17,245.02	11.16	8,026.12	431.83
Maintenance	495.00	2.10	.....	.....	.....	45.22	.....	.....	.....
Operation	891.25	20.80	.....	9.50	.....	43.05	.....	.....	.....
Administration	16,833.04	1,041.20	16.25	551.83	.....	1,088.58	463.64	.....	.....

HONDO PROJECT.

The principal facts relating to the Hondo project are summarized below:

Summary of principal data relating to Hondo project.

County: Chaves:
Townships: 10–13 south, ranges 22–25 east, New Mexico meridian.
Latitude: 33°.
Longitude: 104°.
Altitude: 3,900 feet.
Railroad connections: Eastern Railway of New Mexico, connecting with Texas and Pacific; Southern Pacific; Chicago, Rock Island and Pacific, and Santa Fe system.

Principal markets: Roswell, Amarillo, Fort Worth, and Chicago.
Land office for district: Roswell, N. Mex.
Irrigable area: 10,000 acres; extends from headworks, 12 miles north of Roswell, to the outskirts of the town.
Average elevation: 3,900 feet.
Character of soil: Fertile alluvium.
Range of temperature: Maximum, 100°; minimum, 10°.
Average rainfall on irrigable land: 18 inches.
Ownership of lands: Private.
Size of farm units: 160 acres.
Value of irrigated lands: $80 to $150 per acre.
Principal products: Alfalfa, corn, fruits, and vegetables.
Duty of water: 2½ acre-feet per acre per annum.
Watershed area: 1,037 square miles.
Average annual discharge (estimated) available for storage: 40,000 acre-feet.
Storage reservoir: 1,910 acres; capacity, 40,000 acre-feet.
Storage dams (embankments bringing perimeter of storage reservoir to necessary height): Number, 6; type, earth fill; total length, 16,504 feet; total volume, 526,270 cubic yards.
Diversion dams: One; type, earth fill; length, 100 feet; height, 20 feet.
Total length of main canals: 10.2 miles.
Total length of laterals: 20.2 miles.

Surveys to determine the feasibility of this project were begun in January, 1903. In December, 1903, a land subdivision and topographic party subdivided and classified all the land that would under any circumstances come under the Hondo project. On November 10, 1903, construction of the project was authorized.

Bids for construction were opened at Roswell, N. Mex., on September 6, 1904. In the following table are listed the contracts entered into for building work on the Hondo project. This list includes all contracts for excavation, embankment, masonry, and erection of structures, but does not include such materials as cement, steel, lumber, etc.

Contracts for building work on Hondo project to June 30, 1907.

No.	Contractor.	Feature.	Estimated value.	Payments to June 30, 1907.	Per cent paid.
26	Taylor-Moore Construction Co.	Dam and canals, schedules 1, 3, and 6.[a]	$118,403	$6,609.14	6
27	Slinkard Construction Co...	Dam and canals, schedule 2...	21,119	26,087.04	100
72	Wood, Bancroft & Doty....	Embankments, schedules 3 and 4.	36,908	47,976.40	100
93	T. F. Cazier.....	Canals and laterals.....	10,115	11,397.94	100

[a] Contractor in default; work carried on by force account.

A detailed description of this project has been published in former annual reports.

The storage reservoir is a natural basin, situated at some distance from the river. By building between the surrounding hills earth embankments, six in number, of a height varying from 6.8 to 25.5 feet, and with a total length of 16,504 feet, the storage capacity of the reservoir was increased about fourfold, to the present capacity of 40,000 acre-feet. The flow of the Hondo is diverted by an earth dam 20 feet high and 100 feet long, and is led to the reservoir through a one-bank canal 8,275 feet in length and 70 feet in width at grade. This canal is designed to serve as a settling basin for the silt with which the flood waters of the Hondo are heavily laden, and

with this in view its section is triangular, the side next to the embankment being excavated to a subgrade 4 feet below grade.

The lower bank is provided with two spillgates and five sluice gates, through which it is designed to scour out the accumulated silt as need requires, the silt-laden waters returning to the Hondo. The collection of silt in this canal is encouraged by a weir at its point of discharge into the reservoir, which permits only the upper third of the depth of water in the canal to enter the reservoir.

From the center of the reservoir the water is led to the Hondo River again, through a canal of 10 feet bottom width, 5,300 feet in length. The canal is crossed by one of the embankments, and the water is led under through two lines of iron pipe 3 feet in diameter. The inlet ends of these pipes are in a reenforced concrete tower reached from the bank by a steel foot bridge. A platform at the top of this tower holds the ball-bearing stands operating the outlet gates. After being returned to the Hondo, the water is conveyed down the river channel, a distance of about 1 mile, to the edge of the irrigated district.

The river banks have been built up by the deposition of silt until they are higher than the surrounding country, and this permits ditches to be taken out almost at right angles to the course of the stream. Three low concrete diversion dams, each containing a flash board frame so arranged that it may be dropped to leave the river channel practically unobstructed, serve to throw the water into the four lateral canals. The slope of the surface is so great as to require the construction of frequent drops in these ditches to hold them down to a grade low enough to prevent a cutting velocity. These drops and all similar structures, headgates and the like, are of concrete.

The year ending June 30, 1907, has seen the completion of the work under the Wood, Bancroft & Doty and the T. F. Cazier contracts and of the construction by force account of all remaining concrete structures. Construction is thus completed, the only further work which may possibly come under the head of construction being that which may possibly be necessitated by the development of leaks in the bottom of the reservoir. The period since the completion of the reservoir has been one of unusual drought, and up to this time the reservoir has not impounded enough water fairly to test the soundness of its bottom.

During the irrigating season of 1907 such water as has come down has been furnished to the irrigators under the project, under special contract. As already mentioned, this has been a time of unusual drought, and the water supply has been uncertain and inadequate.

A telephone line has been built by the Reclamation Service from Roswell to the reservoir. This line, which is 14.7 miles long, is located through the center of the farming section and will be available for use by the farmers as well as by the Government's operating employees.

A five-room house has also been built at the reservoir. This was used as headquarters by the engineers during construction and will be the residence of the watchman and gate-keeper during operation of the system.

The expenditures on the Hondo project to June 30, 1907, are summarized in the following tables:

Expenditures, according to physical features, on Hondo project to June 30, 1907.

Character of work.	Engineering and administration.	Building.
Administration of project as a whole	$9,782.81	
Examination of project as a whole	12,490.43	
Rights and property (includes some maintenance and operation)		$22,070.64
Design	908.28	
Subdivision	14.31	
Survey	12,915.02	
Office building		1,576.27
Telephone line		3,044.06
Slinkard contract	1,007.98	26,087.04
T. F. Cazier contract	1,305.00	11,397.94
Wood, Bancroft & Doty contract	1,237.77	47,976.40
Canals and distributing system	2,389.83	17,321.71
Taylor-Moore contract		6,609.14
Government work on Taylor-Moore contract	10,754.73	167,474.52
Total	52,806.16	303,557.72
Grand total	356,363.88	

Total expenditures, according to purpose and nature, on Hondo project to June 30, 1907.

[Total, $356,363.88.]

	Services.	Traveling.	Subsistence.	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination	$4,095.49	$1,297.23	$725.80	$355.43		$299.09	$12.40		
Survey	7,367.17	1,198.87	1,363.62	670.82		1,008.01	53.33	$114.80	
Design	875.16	108.83	.37	62.57		49.37	10.79		$2.78
Subdivision	304.42	31.63		37.08		92.62	7.97		
Building:									
Rights and property	541.85	432.37		20,000.00		26.60			
Building	148,666.78	1,515.23	2,554.81	3,036.97	$19,579.91	14,989.00	765.19	12,340.46	98,794.07
Maintenance	389.67				28.43	18.20			
Administration	8,476.91	980.93	439.51	1,000.53		1,283.82	251.82	105.17	

PROPOSED LAS VEGAS PROJECT.

The Las Vegas project, which is described in the Third Annual Report, is located at Las Vegas, San Miguel County, N. Mex. It contemplates the storage in the valley of Little Sanquijuela Creek of the waters of Sapello and Gallinas rivers, Sanquijuela Creek and Arroyo Pecos, and the irrigation of 10,000 acres in the vicinity of Las Vegas. The only work done during the present fiscal year has been stream measurements.

The net expenditures on this project to June 30, 1907, were $4,760.13.

PROPOSED URTON LAKE PROJECT.

This project is described in the Third Annual Report. It contemplates the irrigation of 60,000 acres by diversion of waters from Pecos River and storage of same in Urton Lake, which has a capacity of 190,000 acre-feet. The only work done on this project during the present fiscal year has been stream measurements. The net expenditures on this project to June 30, 1907, were $17,408.23.

PROPOSED LA PLATA VALLEY PROJECT.

This project is located in the northwest corner of New Mexico and is described in the Fourth Annual Report. No work has been done during the present year, except stream measurements. The net expenditures on this project to June 30, 1907, were $27,968.17.

NEW MEXICO-TEXAS.

RIO GRANDE PROJECT.

GENERAL STATEMENT.

The Third Annual Report contains a complete description of the Rio Grande project, which contemplates the storage near Engle, N. Mex., of the flood waters of the Rio Grande and the irrigation of 155,000 acres of land below in the Las Palomas, Rincon, and Mesilla valleys in New Mexico and Texas, the El Paso Valley in Texas, and the delivery of 60,000 acre-feet of water annually in the bed of the Rio Grande at the present headworks of the old Mexican canal known as the Acequia Madre.

The Fifth Annual Report contains the text of an act extending the provisions of the reclamation act of June 17, 1902 (32 Stat L., 388), to the State of Texas. It also contains the text of a "Convention between the United States and Mexico providing for the equitable distribution of the waters of the Rio Grande for irrigation purposes," which convention having been duly ratified, was proclaimed by the President January 16, 1907.

The act of Congress making appropriations for the sundry civil expenses of the Government for the fiscal year ending June 30, 1907, contains the following provision for delivering water to Mexico from the Rio Grande project:

> Toward the construction of a dam for storing and delivering 60,000 acre-feet of water annually, in the bed of the Rio Grande at the point where the headworks of the Acequia Madre now exists, above the city of Juarez, Mexico, as provided by a convention between the United States and Mexico, proclaimed January sixteenth, nineteen hundred and seven, one million dollars, to be available as needed, and to be expended under the direction of the Secretary of the Interior in connection with the irrigation project on the Rio Grande: *Provided*, That the balance of the cost of said irrigation project over and above the amount herein appropriated shall be allotted by the Secretary of the Interior as may be needed and as may be available from time to time from the reclamation fund, and collected from the settlers and owners of the land benefited under the provisions of the reclamation act approved June seventeenth, nineteen hundred and two, and acts supplemental thereto or amendatory thereof.

No field work has been done on the Rio Grande project during the fiscal year ended June 30, 1907, except the examination of land-office and court records relating to land titles in the Engle reservoir site. Construction work on the Leasburg unit has been carried on since November, 1906, and is hereinafter described.

The net expenditures on the Rio Grande project, aside from the Leasburg unit, to June 30, 1907, were $48,730.40.

LEASBURG UNIT.

The main features of the Leasburg diversion are summarized below.

Summary of principal data relating to the Leasburg diversion.

State: New Mexico.
County: Dona Ana.
Latitude: 32°.
Longitude: 106° 47′.
Railroad connections: Las Cruces, Dona Ana, and Mesilla Park on Atchison, Topeka and Santa Fe Railroad.
Principal markets: El Paso, Tex., and Las Cruces, N. Mex.
Irrigable area: 10,000 acres on Rio Grande bottom.
Elevation of irrigable area: 3,850 feet.
Character of soil: Fertile alluvium.
Range of temperature: 0° to 110°.
Average rainfall: 9.4 inches.
Ownership of land: All private.
Value of irrigated land: $100 to $150 per acre.
Principal products: Alfalfa, corn, fruit, vegetables, and melons.
Duty of water: 2½ acre-feet per acre per annum.
Watershed area: 37,000 square miles.
Diversion dam: Concrete weir and earthen embankment.
Canals: Length, 6 miles.

DAM AND CANAL.

Surveys, plans, and estimates having been completed for a diversion dam, 6 miles of main canal and structures, and change of river channel, to deliver water to the existing headings of the Dona Ana and Las Cruces-Mesilla community ditches, bids were opened at Las Cruces, N. Mex., on October 16, 1906, for the construction of this work. Only two bids were received, and only one—that of John P. Nelson, of San Antonio, Tex.—was for the entire work called for in the plans and specifications. Mr. Nelson's bid being a satisfactory one, the contract was awarded to him.

As required by the contract, actual construction work was begun within fifteen days after the signature of the contract by the Secretary of the Interior. Earth excavation on the canal was diligently prosecuted between November 29, 1906, and May 1, 1907, when the excavation was 88.5 per cent completed. The 1,600-foot earth embankment at the west end of the diversion weir was practically completed by March 19, 1907. Excavation and pile driving for the change of river channel was completed by April 16, 1907. Work on the concrete weir and abutments, headgates and sluicegates in Penasco Rock, sand sluiceway, concrete drops, timber arroyo crossings and bridges was very materially delayed by slow delivery of materials by the railroad company. An unprecedented high stage of the Rio Grande, which has continued throughout the entire year, has been another serious handicap to the contractor. The existence of heavy gravel and bowlder deposits about 10 feet below the foundation of the weir has made the driving of timber sheet piling very difficult. In view of the existing conditions, on April 2, 1907, the contractor was granted an extension of sixty days from April 14, 1907, within which to complete his contract, and again on June 17, 1907, a further extension of thirty days from June 13, 1907, was granted.

On June 30 the contractor had completed 57 per cent of the work called for under his contract. All structures on the canal below the head gates are well along toward completion. The change of river channel is 93 per cent completed. The contractor could not complete the work by July 13, and asked for a further extension of three months, which was granted. Water can not be delivered through the canal during the present irrigating season, and there appears to be no good reason why the contractor should be required to incur additional expense in order to secure an early completion of his contract. It is now estimated that this feature of the Rio Grande project will be completed by December 1, 1907.

In accordance with the custom of the Reclamation Service, all cement, reenforcing and structural steel, and cast iron were furnished the contractor on board cars at the nearest railroad station, Selden, N. Mex.

Bids were opened at Las Cruces, N. Mex., November 1, 1906, for furnishing 2,500 barrels of Portland cement. The lowest bid received was higher than the cement could then be purchased in the open market, and all bids were rejected and the cement purchased in open market from the Iola Portland Cement Company, of Iola, Kans., at $1.64 per barrel f. o. b. Iola, Kans.

On November 15, 1906, bids were opened at Las Cruces for furnishing all reenforcing and structural steel and cast iron. The successful bidder was the Midland Bridge Company, of Kansas City, Mo. All material specified in the contract with this company has been delivered.

A plane-table survey has been made of all lands to be benefited by this work, showing the size and location of all private holdings.

EXPENDITURES.

The expenditures on the Leasburg diversion and on the Rio Grande project, exclusive of the Leasburg diversion, are summarized in the following tables:

Expenditures, according to physical features, on Leasburg project to June 30, 1907.

Features.	Engineering.	Building.
Irrigation structures:		
Embankment at west end of diversion dam	$322.07	$2,927.88
Concrete weir and abutments at diversion dam	7,186.64	15,000.48
Head gates and sluice gates at diversion dam	1,781.13	
Canal, station 0 to station 60	2,501.81	14,983.00
Canal, station 60 to station 310	1,139.20	16,544.03
Sand sluiceway	1,205.23	931.25
6-foot drop on canal	594.04	1,945.44
4-foot drop on canal	584.39	1,834.29
30-foot arroyo crossing at station 162	254.48	1,208.70
20-foot arroyo crossing at station 191	165.68	340.15
20-foot arroyo crossing at station 215	181.58	428.28
Bridges across canal	119.29	67.50
Change of river channel	1,007.36	8,207.50
Irrigable lands:		
Farm-unit subdivision and soil examination	548.23	
Water users' associations	94.60	
Examination of project as a whole	314.39	
Rights and property	405.23	
Administration of project as a whole	6,933.44	
Total	25,338.79	64,418.50
Grand total	$89,757.29	

Total expenditures, according to purpose and nature, on Leasburg diversion to June 30, 1907.

[Total, $89,757.29.]

	Services.	Traveling.	Subsistence.	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination	$212.60	$81.58	$23.77	.....	.....	$26.27	$16.14	$5.67	.....
Survey	2,702.62	188.66	513.71	.....	$4.32	219.14	275.16	562.45	.....
Design	1,609.55	36.27	2.24	$0.81	.....	14.46	36.51	.....	$31.63
Subdivision	297.53	13.17	.....	10.75	.....	112.13	1.83	.....	.....
Building:									
Rights and property	254.00	125.48	.....	.....	.....	18.31	.....	.....	.....
Building	4,965.92	358.75	43.96	137.75	4,750.69	493.48	157.01	341.25	64,172.31
Administration	5,251.24	762.09	3.09	367.39	.....	420.51	135.09	.....	.....

NORTH DAKOTA.

WILLISTON PROJECT.

GENERAL STATEMENT.

The general features of the Williston project are summarized below:

Summary of principal data relating to Williston project.

County: Williams.
Townships: 153, 154, 155 north, ranges 100, 101 west, fifth principal meridian.
Latitude: 48° 10′.
Longitude: 103° 30′.
Altitude: 1,875 feet.
Railway connections: Main line Great Northern Railway.
Principal markets: St. Paul, Minneapolis, Duluth, and Chicago.
Land office for district: Williston.
Irrigable area: Bench and cleared bottoms, 8,000 acres; brush bottoms, 4,000 acres.
Ownership of lands: Public, 1,000 acres; State and school, 200 acres; private, 10,800 acres.
Average elevation: 1,850 to 1,900 feet.
Character of soil: Benches, sandy loam; cleared bottoms, heavy clay; brush bottoms, sandy.
Range of temperature: Maximum, 107°; minimum, —54°.
Average rainfall: 15 inches.
Average rainfall during three summer months: 7.5 inches.
Size of farm unit: 160 acres.
Principal products: Present, wheat, flax, oats, vegetables; under irrigation, alfalfa, sugar beets, small fruits.
Duty of water: 2 acre-feet per acre per annum.
Source of supply: Missouri River.
Minimum discharge: 10,000 second-feet.
Canals and laterals: 60 miles.
Power development: 1,500 horsepower.
Generating station building: 90 feet by 90 feet.
Steam boilers: 6 water-tube Stirling, 250 horsepower each.
Furnaces: Dutch-oven, with rocking grates and forced draft.
Stacks: Three steel stacks, each 54 inches diameter and 135 feet high.
Fuel: Lignite coal from mine owned and operated by United States.
Number and size of generating units: 2 of 300 kilowatts capacity each.
Type of prime movers: Condensing horizontal steam turbines.
Type of generators: 3-phase, 2,200 volts and 60 cycles.
Number and size of transformers: 3 of 250 kilowatts capacity.
Type of transformer: Water cooled, 2,200 to 22,000 volts.
Transmission line: 4 miles built, 14 miles required.
Pumping stations: 4; one combined with steam-generating plant.
Type of buildings: 1 concrete, 2 brick, and 1 floating barge.
Type of pumping units: 8 centrifugal pumps, 2 steam turbines, 6 motors.
Capacity of pumps: 185 second-feet; pumping lifts 25 to 55 feet.
Rated power of 2 steam turbines: 450 horsepower.
Rated power of 6 motors: 725 horsepower.

The Buford-Trenton, Williston, and Nesson projects, comprising the Williston district, are located in Williams County, on the left bank of Missouri River. It is proposed to pump water from Missouri River into canals crossing the valley and bench lands. Lignite

coal, mined on Government lands adjacent to the pumping plants, will be used as fuel. General descriptions of these projects may be found in preceding annual reports.

The Buford-Trenton and Williston projects, which are now under construction, involve the use of electrically operated pumps, all of which are supplied with electric power from the main generating station, situated about 3 miles north of the city of Williston. The Nesson project will also require the installation of electrical pumping machinery, and the main generating plant for this project will be located close to the lignite-coal mine, which will furnish the fuel required.

Preliminary examination of the Williston project was begun in September, 1904, and consisted chiefly of investigations for lignite coal. Detailed surveys and coal borings were made during the season of 1905. An outline of the project, with plans and estimates, was considered by a board of engineers, which met at Williston, September 22, 1905, and recommendation made that $1,000,000 be set aside for this project, based on a contemplated total area of 40,000 acres. The board recommended that the initial work consist in developing the smallest fractional part that would demonstrate the feasibility of this pumping project.

The portion of these amounts to be spent on the Williston project was left for future adjustment. The estimates of cost considered by the board of engineers was based upon the unit prices on contracts then in progress on other projects, and was approximately $25 per acre.

The initial unit now under consideration for construction will provide water for about 12,000 acres of land.

On May 5, 1906, the Williston Water Users' Association voted to enter into a contract with the Secretary of the Interior to return to the reclamation fund the cost of the irrigation works for the Williston project. The contract was executed May 23, 1906.

The portion of the Williston project selected for initial development includes about 12,000 acres of irrigable land situated north, east, and west of the city of Williston. About 7,000 acres, lying north of the Great Northern Railway tracks and extending up the valley of the Little Muddy about 10 miles, are covered by the canal system now under construction. The larger part of this area consists of bench lands, but some creek bottom lands are included. The remaining 5,000 acres are situated in the river bottoms, which are now largely covered with brush and timber. The canal system for the bottom lands has not yet been commenced. Contracts now in force are shown in the following table:

Contracts Williston project, June 30, 1907.

No. of contract.	Contractor.	Feature.	Estimated total value.	Payments to June 30, 1907.	Per cent paid.
123	D'Olier Engineering Co.	Steam boilers and pumping machinery.	$76,229.50	$16,414.75	21.6
131	General Electric Co.	Electric generating machinery	41,242.00	.....	.....
132	John H. Donohue	Power-house building	15,055.00	7,610.57	50.5
136	Henry C. De Laney	Canals and structures	81,867.00	13,675.13	16.7
	D'Olier Engineering Co.	Apparatus pump station 4	4,880.00	393.75	8.0
	do	Installing boilers at power house.	5,589.00	1,397.26	25.0

All the water for this project will be pumped from Missouri River and power for the purpose will be developed in a main power plant situated about 3 miles north of Williston and close to the lignite coal mine owned and operated by the United States. Construction work under contracts now in force is being done on the main power plant and three electrically-operated pumping plants.

The main power plant contains a steam-boiler equipment of 1,500 rated horsepower in Sterling water-tube boilers, provided with furnaces designed especially for using the low-grade North Dakota lignite for fuel. This power plant will furnish also the power required for operating the pumping plants on the Buford-Trenton project, for which purpose its capacity will have to be increased eventually about 50 or 75 per cent.

The pumping station which takes the water from the river and discharges it into a settling basin on the bank consists of a flat bottom scow or barge, 60 feet long and 24 feet wide. By the use of flexible metallic ball-and-socket joints the discharge pipes which carry the water from the barge to the bank are so supported that the barge is free to rise and fall with fluctuations in river level. The three centrifugal pumps on this barge have a combined capacity of 90 second-feet—sufficient for the 7,000 acres now covered by the canal system.

Additional intake pumping stations will be required for each of the bottoms, to be provided for later.

At all pumping stations located on Missouri River itself the pumping lifts vary from about 15 feet at high water to about 30 feet at low water. To provide for this fluctuation in the pumping lift the speed of the centrifugal pumps will be controlled by changing the rate of alternations of the electric power current. In order to provide for this the electric generating units at the power plant are equipped with adjustable speed governors on the steam turbines.

Two small pumping stations, one having a capacity of 35 second feet, the other a capacity of 20 second-feet, and each having a pumping lift of 30 feet, raise water from the main canal to higher canals for the bench lands north of the city of Williston. The pumps in these stations are driven by motors of 75 and 100 horsepower capacity.

In connection with the main power plant there are two steam-turbine pumping units, each with a capacity of 20 second-feet under a pumping lift of 60 feet. These pumps supply water to the high line canal, which extends up the Little Muddy Valley a distance of about 7 miles. The maximum height above lowest river level to which water is pumped on this project at present is about 90 feet.

It was anticipated when the present contracts were made that all the machinery would be installed and ready for operation early in July, 1907. Owing, however, to the severe winter of 1907, which interfered with railroad transportation, and to the unusually cold, late spring, which seriously interfered with the hauling of material, the placing of concrete, etc., the power and pumping system will not be ready for operation until about the middle of September. The machinery will then be tested in the manner prescribed by the various contracts. It is expected that regular operation of the system will begin at the opening of the irrigation season in 1908.

The following are the bids received for pumping machinery:

Bids opened August 14, 1906, for power and pumping system, Williston project, North Dakota.

[Specifications No. 100.]

BIDDERS.

A: Camden Iron Works, Camden, N. J.; schedule B, $24,700, alternate, $22,300; schedule D, $10,275; schedule E, $17,640.

B: Chas. C. Moore & Co., San Francisco, Cal.; schedule A, $55,545; schedule B, $29,400 alternate, $27,130; schedule C, $53,250; schedule D, $11,510 schedule E, $26,425; schedule F, $4,560; schedule G, $25,394; lump sum, including schedules A, B, C, D, and E, $171,500; A, B, D, and E, $118,500; A, B, C, D, E, F, and G, $201,000.

C: Westinghouse Electric and Manufacturing Company, Pittsburg, Pa.; schedule C, $44,013.99.

D: D'Olier Engineering Company, Philadelphia, Pa.; schedule A, $32,279.50; schedule B, $19,400; schedule C, $45,360; schedule D, $9,193; schedule E, $16,674 schedule F, $4,630; lump sum bid, including schedules A, B, and C, $95,180; D and E, $25,100; D, E, and F, $29,100; A, B, C, D, E, and F, $124,000; B, D, and E, $43,950; B, D, E, and F, $47,950.

E: General Electric Company, Schenectady, N. Y.; schedule C, $41,242.

F: Joseph McWilliams & Co., Louisville, Ky.; lump sum bid, schedules, A, B, C, D, E, and F, $108,900.

G: Gilbert Wilkes & Co., Denver, Colo.: schedule A, $28,850.

H: United ron Works, Oakland, Cal.; schedule B, $26,200; alternate, $29,000; schedule D, $12,700; schedule E, $28,000; lump sum bid, schedules B, D, and E, $58,000.

I: Hurley & Co., St. Paul, Minn. schedule A, $43,848 schedule B, $18,615; alternate, $17,208; lump sum bid, schedules A and B, $79,671.

J: Platte Iron Works, Dayton, Ohio: schedule B, $21,600; alternate, $21,100; schedule D, $8,975; schedule E, $22,450.

SCHEDULE A.

Four water-tube boilers:
Bidder B, $30,400.
Bidder D, $26,014.
Bidder G, $23,000.
Bidder I, $32,435.

SCHEDULE A—Continued.

Two additional boilers:
Bidder B, $2,900.
Bidder D, $3,515.50.
Bidder G, $1,850.
Bidder I, $4,567.

Forced-draft outfit:
Bidder B, $11,000.
Bidder D, (included in item 1).
Bidder G, $1,244.
Bidder I, $1,244.

Duplex feed pumps (2):
Bidder B, $6,900.
Bidder D, $900.
Bidder G, $1,153.
Bidder I, $2,395.

Closed feed water heater:
Bidder B, $4,245.
Bidder D, $1,850.
Bidder G, $1,603.
Bidder I, $3,208.

SCHEDULE B.

Direct-connected steam-driven centrifugal pumping units (2):
Bidder A, $24,700.
Bidder B, $29,400.
Bidder D, $19,400.
Bidder H, $26,200.
Bidder I, $18,615.
Bidder J, $21,600.

Alternate to water-tube boilers in schedule A:
Bidder A, $13,800.
Bidder B, $19,000.
Bidder D, $12,400.
Bidder H, $15,000.
Bidder I, $9,358.
Bidder J, $12,600.

Alternate to additional boilers in schedule A:
Bidder A, $8,500.
Bidder B, $8,130.
Bidder D, $7,000.
Bidder H, $14,000.
Bidder I, $7,850.
Bidder J, $8,500.

SCHEDULE C.

300-kilowatt steam turbine sets (2):
Bidder B, $35,000.
Bidder C, $34,581.95.
Bidder D, $32,500.
Bidder E, $32,078.

Motor-driven centrifugal circulating pump:
Bidder B, $2,830.
Bidder C, $1,106.55.
Bidder D, $1,585.
Bidder E, $1,517.

SCHEDULE C—Continued.

Engine-driven exciter:
Bidder B, $2,500.
Bidder C, $1,229.47.
Bidder D, $1,480.
Bidder E, $1,195.
Motor-driven exciter:
Bidder B, $970.
Bidder C, $616.65.
Bidder D, $1,450.
Bidder E, $725.
Switch board:
Bidder B, $2,000.
Bidder C, $2,093.12.
Bidder D, $2,260.
Bidder E, $975.
25-kilowatt transformers (3):
Bidder B, $1,000.
Bidder C, $712.25.
Bidder D, $575.
Bidder E, $738.
200-kilowatt transformers (3):
Bidder B, $7,500.
Bidder C, $2,892.
Bidder D, $4,550.
Bidder E, $3,184.
5-ton 26-foot crane:
Bidder B, $1,450.
Bidder C, $782.
Bidder D, $960.
Bidder E, $830.
Per foot for additional span:
Bidder C, $5.50.
Bidder D, $12.50.
Bidder E, $12.
Bidder F, $12.

SCHEDULE D.

Motor-driven pumping unit, 20 cubic feet:
Bidder A, $4,350.
Bidder B, $5,500.
Bidder D, $4,276.
Bidder H, $6,000.
Bidder J, $4,000.
Motor-driven pumping unit, 15 cubic feet:
Bidder A, $3,800.
Bidder B, $4,400.
Bidder D, $3,410.
Bidder H, $5,000.
Bidder J, $3,600.

SCHEDULE D—Continued.

50-kilowatt transformers (3):
Bidder A, $2,125.
Bidder B, $1,610.
Bidder D, $1,507.
Bidder H, $1,700.
Bidder J, $1,375.

SCHEDULE E.

Motor-driven pumping units, 30 cubic feet (2):
Bidder A, $10,300.
Bidder B, $13,000.
Bidder D, $9,676.
Bidder H, $15,500.
Bidder J, $10,300.
Additional pumping units, 30 cubic feet (2):
Bidder A, $3,350.
Bidder B, $9,500.
Bidder D, $4,138.
Bidder H, $7,500.
Bidder J, $4,500.
150-kilowatt transformers (3):
Bidder A, $3,990.
Bidder B, $3,925.
Bidder D, $2,860.
Bidder H, $5,000.
Bidder J, $3,150.

SCHEDULE F.

3 miles 22,000-volt transmission:
Bidder B, $4,560.
Bidder D, $4,630.

SCHEDULE G.

Excavation, 1,200 cu. yds.:
Bidder B, 50 cents per cu. yd.
Concrete, class 1, 490 cu. yds.:
Bidder B, $20 per cu. yd.
Concrete, class 2, 520 cu. yds.:
Bidder B, $19 per cu. yd.
Structural steel, 26,400 pounds:
Bidder B, 7½ cents per pound.
Lumber, class 1, 18,900 ft. B. M.:
Bidder B, $60 per M ft. B. M.
Roofing, class 1, 100 squares:
Bidder B, $20 per square.

The following is an abstract of the bids received on canals and structures:

Bid of Henry C. De Lancy, Williston, N. Dak., for canals and structures, Williston project, N. Dak., being only bid received, August 30. 1906.

[Specifications No. 105.]

Amount of bid, $81,867.
Excavation, class 1, 120,000 cubic yards: 25 cents per cubic yard.
Excavation, class 2, 100 cubic yards: 80 cents per cubic yard.
Excavation, class 3, 50 cubic yards: $1.50 per cubic yard.
Excavation, class 4, 250 cubic yards: $15 per cubic yard.
10 second-foot laterals, 7 linear miles: $270 per linear mile.

5 second-foot laterals, 45 linear miles: $225 per linear mile.
Waste water ditches, 20 linear miles: $190 per linear mile.
Overhaul, 2,000 cubic yards: $0.015 per cubic yard.
Puddling, 100 cubic yards: 90 cents per cubic yard.
Riprap, 100 cubic yards: $3 per cubic yard.
Concrete, class 1, 50 cubic yards: $8 per cubic yard.
Concrete, class 2, 1,000 cubic yards: $13 per cubic yard.
Sheet piles, delivered, 10 M feet B. M.: $48 per M feet B. M.
Sheet piles, driven, 2,400 linear feet: 50 cents per linear foot.
Bridges, type 1, 26-foot span, 1 complete: $375.
Bridges, type 1, 18-foot span, 3 complete: $275 each.
Bridges, type 1, 16-foot span, 2 complete: $230 each.
Bridges, type 1, 14-foot span, 4 complete: $207 each.
Bridges, type 1, 12-foot span, 12 complete: $165 each.
Bridges, type 2, 8-foot span, 40 complete: $100 each.
Flumes, 80-foot span, 2 complete, except excavation and concrete: $375 each.
Culverts, 10,000 feet class 2 lumber: $48 per 1,000 feet.
Turnouts, 15,000 feet class 2 lumber: $85 per 1,000 feet.
Wooden gates, 1,500 feet class 1 lumber, dressed: $80 per 1,000 feet.
Stop planks, 300: 75 cents each.
Preserving lumber, 15,000 feet, class 1, dressed: $15 per 1,000 feet.
Terra cotta pipe culverts, 12-inch, 100 linear feet: $3 per linear foot.
Terra cotta pipe culverts, 15-inch, 100 linear feet: $3.50 per linear foot.
Terra cotta pipe culverts, 18-inch, 400 linear feet: $4.50 per linear foot.
Pumping station No. 2, building and intake: $1,594.
Pumping station No. 4, building and intake: $1,060.

LIGNITE COAL MINE.

Borings to determine the location and quality of the lignite coal veins in the hills east of Williston were continued during the fall of 1906. The mine as now located has an elevation of about 1,905 feet at the portal. The distance from the mine to the power plant is about 1,250 feet, and the 30-inch gauge track now being laid on a 2 per cent grade will enable the loaded mine cars to run by gravity directly to the coal crusher at the power plant. The crushed coal will be stored in bins built along the east side of the boiler room.

The mine entry is 6 feet wide by 7 feet high and is timbered, top and sides, from the portal to where the solid coal was encountered, a distance of about 250 feet; beyond that only the supporting bents and top lagging are required, about 2 feet of coal at the top of the vein being allowed to remain as a roof. The entry is level for the first 325 feet from the portal; beyond that it will conform to the pitch of the coal vein, which slopes at the rate of about 4 feet in 1,000 feet in the direction the entry is pointed.

About 170 feet from the portal the first crosscut is located. Its length is 50 feet, and at its end the main air shaft is located. This is a timbered shaft 5 feet square and the lagging is continued above the surface of the ground about 27 feet. A fire built at the foot of the air shaft draws out the gases and smoke produced by blasting, causing pure air to flow into the main entry. In this way the mine is kept dry and safe. From the air shaft the air entry is carried forward parallel to the main entry and separated from it by a wall of coal 50 feet thick. Crosscuts are made between the two at 75-foot intervals, and by keeping open only the last crosscut the air is forced to pass through the entire length of both entries.

A working face of coal has been obtained in both main and air entry, so that about 3 short tons of coal are obtained in each foot as each entry is carried forward. If three eight-hour shifts are worked *per day, and* each shift advances 3 feet, the yield of coal from both

entries will be from 40 to 50 tons each twenty-four hours. This will be sufficient to supply the power plant during the first season. Side entries and rooms will be opened up when the main entry has been extended a few hundred feet into the coal, and a saving in the cost of mining will then be effected. The proposed mining method to be followed in this mine is that known as the "room-and-pillar retreat" method. The amount of lignite coal that can be mined from the vein now being worked is about 300,000 tons within the area covered by the borings.

EXPENDITURES.

The expenditures on this project to June 30, 1907, are summarized in the following tables:

Expenditures, according to physical features, on Williston project, North Dakota, to June 30, 1907.

Features.	Engineering and administration.	Building.
Incidental structures:		
Office building	$112.61	$2,003.44
Lodging house	82.01	498.49
Bunk house and carriage shed	.....	256.15
Mess house	.....	949.84
Engineer's cottage at power house	15.00	943.70
Barn at power house	20.00	928.46
Water system at headquarters camp	.....	576.05
Inventory feed at headquarters and temporary corrals	277.69	.....
Equipment (not chargeable to any particular feature)	7,262.85	.....
Irrigation structures:		
Power house (pumping station No. 1)	1,851.71	20,064.71
Pumping station No. 2	103.49	1,318.83
Pumping station No. 3 (intake barge)	659.29	8,715.29
Pumping station No. 4	111.24	565.61
Distributing system	11,159.64	18,388.41
Transmission line	.....	6,487.43
Coal mine	398.10	4,768.47
Transformer station for barge	37.33	715.00
Real estate	836.44	942.95
Pleasantview town site	18.68	.....
Inventory—Storehouse	.....	301.75
Steel	.....	2,648.57
Cement	.....	2,389.53
Lumber	.....	17.70
Irrigable lands: Farm unit subdivision, soil examination	136.96	.....
Examination of project as a whole	17,860.76	.....
Administration of project as a whole	12,774.05	.....
Totals	53,717.85	73,490.38
Grand total	127,198.23	

Total expenditures, according to purpose and nature, on Williston project to June 30, 1907.

[Total, $127,198.23.]

	Services.	Traveling.	Subsistence.	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination	$6,652.33	$555.08	$632.56	$3,063.37	.....	$448.57	$117.10	$318.95	$305.71
Survey	10,977.74	607.68	2,174.29	1,340.18	$6.65	778.81	156.05	1,203.90	.....
Design	4,845.964	448.34	96.02	8.44	1.30	64.31	3.88	.....	53.96
Subdivision	147.95	39.66	9.74	.05	1.54	1.70	.62	.....	.....
Building:									
Rights and property	539.99	442.65	.....	6.80	780.00	142.25	.....	.....	.....
Building	17,619.71	315.42	12.45	2,198.26	16,599.15	1,917.60	2.61	1,065.98	213.10
Executive	8,059.05	859.38	22.23	768.88	25.14	1,399.50	235.64	.....	.....

BUFORD-TRENTON PROJECT.

GENERAL STATEMENT.

The main facts relating to the Buford-Trenton project are summarized below:

Summary of principal data relating to Buford-Trenton project.

County: Williams.
Townships: 152, 153 north, ranges 102, 103, and 104 west, fifth principal meridian.
Latitude, 47° 55′.
Longitude: 103° 46′.
Average elevation: 1,900 feet.
Principal markets: St. Paul, Minneapolis, Duluth, and Chicago.
Railway connections: Main line of Great Northern Railway, Buford and Trenton stations.
Land office for district: Williston.
Irrigable area: Buford flat, public, 1,200 acres; private, 11,300 acres.
Character of soil: Bench lands, sandy loam and clay; bottom lands, light, sandy loam.
Range of temperature: Maximum, 107°; minimum, —54°.
Average rainfall: 15 inches.
Size of farm unit: 160 acres.
Principal products: At present, wheat, flax, oats, etc.; under irrigation, alfalfa, sugar beets, and fruits.
Duty of water: 2 acre-feet per acre per annum.
Source of supply: Missouri River.
Minimum discharge: 10,000 second-feet.
Main canal: A, 5 miles, with initial capacity of 60 second-feet; B, 10 miles, with initial capacity of 80 second-feet.
Laterals: 25 miles, capacities 5 and 10 second-feet.
Power required: 1,500 horsepower, to be delivered from Williston power plant.
Electric transmission line: 25 miles, Williston to Buford.
Pumping stations: Station No. 1, floating barge, 70 by 24 feet; station No. 2, concrete building, 21 by 65 feet.
Pumping units: 8 centrifugal pumps driven by electric motors.
Capacity of pumps: Station No. 1, 120 second-feet; station No. 2, 64 second-feet.
Pumping lifts: At station No. 1, 30 feet; at station No. 2, 50 feet.
Rated capacity of motors: 6 of 160 horsepower and 2 of 135 horsepower.
Number and size of transformers: 3 of 300 kilowatts each.
Type of transformer: Water cooled, 2,200 to 22,000 volts.

Preliminary examination of this project was begun September, 1904. A favorable report was made by a board of engineers which met at Bismarck November 2, and an allotment of $550,000 was made November 18, 1904, to cover the pumping projects then under consideration. During the field season of 1905 detail surveys were carried on and plans and estimates prepared.

On September 22, 1905, a board of engineers met at Williston and recommended that the Buford-Trenton project be constructed as soon as practicable. The policy advocated by the board was that a fractional part of the project, probably about 10,000 acres, be first undertaken, and extensions be deferred until the success of the enterprise was demonstrated.

The work now authorized for construction will supply water to about 12,000 acres. A contract with the Buford-Trenton Water Users' Association, to cover the construction of the irrigation works, was executed May 23, 1906.

This project covers bench and bottom lands extending eastward along the left bank of Missouri River about 15 miles from the State line between North Dakota and Montana. The Great Northern Railway skirts its northern limits. It comprises two distinct areas; the western, called the Buford flat, contains about 11,000 acres of irrigable lands; the eastern, called the Trenton flat, contains about 3,000 acres of irrigable lands. No work is in progress on the latter. On the former the present contracts will provide the canal system for irrigating only the 5,000 acres of cleared bench land, leaving the 6,000 provided for during the coming year.

Bids were invited September 11, 1907 for building the entire canal and lateral system, but the only one received, that of H. C. De Laney, for $166,334, was considered too high and was rejected. The pumping machinery for supplying the entire 11,000 acres of the Buford flat has been purchased under the contract with the D'Olier Engineering Company and is being installed in two pumping stations located about 2 miles below the mouth of the Yellowstone and about 1 mile south of Buford, on the Great Northern Railway.

The general features of this project were described on page 229 of the Fifth Annual Report. Construction work has been in progress on the two pumping stations, the concrete pressure pipe and structures, the "A" canal and the lateral system which will furnish water to about 5,000 acres in the spring of 1908. The contracts now in force are as follows:

Contracts, Buford-Trenton project, June 30, 1907.

No. of contract.	Contractor.	Feature.	Estimated total value.	Payments to June 30, 1907.	Per cent paid.
134	D'Olier Engineering Co.	Pumping machinery	$40,906.00	.....	.....
153	J. S. Penson	Pumping station 2	3,333.00	$510.44	5.4
154	Penson & King	Canals and structures	20,867.75	1,134.75	15.3
159	James Burton	Concrete pressure pipe	13,282.50	216.00	1.6
178	J. S. Penson	Settling basin	5,150.00	.....	.....

The pumping machinery, consisting of four electrically driven centrifugal pumps for each of the two stations, has been installed and the floating barge, carrying the pumps, which take water directly from the Missouri River, has been built by force account. The concrete building of station 2 will be completed under contract with J. S. Penson. The canals and structures covered by contract of Penson & King are now well advanced. They should be finished before December 1, 1907.

The pressure pipe, which connects the pumps of station 2 with the head of canal "A" will probably be completed by the contractor, James Burton, before freezing weather interrupts the work. The settling basin, which has an area of about 2 acres, is nearing completion. The sluice gates, the bulkhead, and the discharge pipes from the barge pumping plant to the settling basin, will be furnished and erected by force account and will not be completed until the spring of 1908.

The electric power transmission line, extending from the Williston generating plant to the Buford pumping stations, a distance of 25 miles, is being erected by force account. The poles have been purchased, but on account of the high price of copper wire during the

present season contract for the line wires has not yet been placed. Consequently the pumping of water on this project can not begin this year, but will be deferred until the weather in the spring of 1908 permits the completion of the transmission line. A soil survey covering 25,000 acres was made in July, 1906.

The following bids were received for furnishing pumping machinery:

Bids opened September 10, 1906, for pumping machinery, Buford-Trenton project, North Dakota.

[Specifications No. 107.]

BIDDERS.

A: D'Olier Engineering Company, Philadelphia, Pa., $40,906.
B: McCay Engineering Company, Baltimore, Md., $47,790.
C: N. S. Sherman Machinery Company, Independence, Kans., $52,580.45.
D: Camden Iron Works, Camden, N. J., $40,574.50.

ITEM 1.

Four pumping units for the intake:
Bidder A, $14,790.
Bidder B, $19,105.
Bidder C, $20,644.80.
Bidder D, $17,375.

ITEM 2.

Two pumping units, with induction motors for station No. 2:
Bidder A, $7,390.
Bidder B, $8,142.
Bidder C, $7,907.20.
Bidder D, $6,372.

ITEM 3.

Two pumping units, with synchronous motor:
Bidder A, $9,095.
Bidder B, $9,747.
Bidder C, $8,687.20.
Bidder D, $8,180.

ITEM 4.

Approximately 7,000 pounds riveted steel discharge piping:
Bidder A, $1,050.
Bidder B, $2,100.
Bidder C, $2,100.
Bidder D, $507.50.

ITEM 5.

One exciter for station No. 2:
Bidder A, $1,166.
Bidder B, $751.
Bidder C, $1,773.75
Bidder D, $842.

ITEM 6.

Three 300-kilowatt transformers:
Bidder A, $3,755.
Bidder B, $3,980.
Bidder C, $5,445.
Bidder D, $3,739.

ITEM 7.

All instruments and wiring for station No. 2:
Bidder A, $2,995.
Bidder B, $3,265.
Bidder C, $4,372.50.
Bidder D, $3,090.

ITEM 8.

One 5-ton traveling crane:
Bidder A, $665.
Bidder B, $700.
Bidder C, $1,650.
Bidder D, $469.

The following bid was received on canals and structures:

Bid of Henry C. De Lancy, Williston, N. Dak., for canals and structures, Buford-Trenton project, North Dakota, being only bid received, September 11, 1906.

[Specifications No. 108.]

CANALS AND STRUCTURES.

Total amount of bid, $166,334.
Excavation, class 1, 365,000 cubic yards: 30 cents per cubic yard.
Excavation, class 2, 100 cubic yards: 60 cents per cubic yard.
Excavation, class 3, 100 cubic yards: 95 cents per cubic yard.
Excavation, class 4, 100 cubic yards: $1.50 per cubic yard.

10-second-foot canals, 3 linear miles: $375 per linear mile.
5-second-foot canals, 25 linear miles: $325 per linear mile.
Waste-water ditches, 10 linear miles: $290 per linear mile.
Overhaul, 3,000 cubic yards: 1½ cents per cubic yard.
Puddling, 100 cubic yards: $1 per cubic yard.
Riprap, 150 cubic yards: $5 per cubic yard.
Concrete, class 1, 50 cubic yards: $10 per cubic yard.
Concrete, class 2, 1,200 cubic yards: $17 per cubic yard.
Sheet piles, delivered, 13,600 feet B. M.: $50 per M feet B. M.
Sheet piles, driven, 2,000 linear feet: 50 cents per linear foot.
Bridges, type 1, 26-foot span, 1 complete: $450.
Bridges, type 1, 22-foot span, 2 complete: $430 each.
Bridges, type 1, 18-foot span, 1 complete: $400.
Bridges, type 1, 16-foot span, 1 complete: $350.
Bridges, type 1, 12-foot span, 1 complete: $340.
Bridges, type 2, 8-foot span, 16 complete: $110 each.
Bridges, type 2, 6-foot span, 8 complete: $90 each.
Flume crossings, 5,000 feet B. M.: $85 per M feet B. M.
Structural steel, 9,500 pounds: 7 cents per pound.
Culverts, 5,000 feet B. M., class 2: $60 per M feet B. M.
Turn-outs, 10,000 feet B. M., class 2: $80 per M feet B. M.
Wooden gates, 1,000 feet B. M., class 1: $80 per M feet B. M.
Stop planks, 400 planks: 75 cents each.
Preserving lumber, 8,000 feet B. M.: $15 per M feet B. M.
Terra-cotta-pipe culverts, 12-inch, 100 linear feet: $3.50 per linear foot.
Terra-cotta-pipe culverts, 15-inch, 100 linear feet: $4 per linear foot.
Terra-cotta-pipe culverts, 18-inch, 200 linear feet: $5 per linear foot.

PUMPING STATION.

Excavation, class 1, 130 cubic yards: 50 cents per cubic yard.
Concrete, class 1, 145 cubic yards: $16 per cubic yard.
Lumber, class 2, 5,500 feet B. M.: $60 per M feet B. M.
Sheet piles, delivered, 2,000 feet B. M.: $60 per M feet B. M.
Sheet piles, driven, 450 linear feet: 50 cents per linear foot.
Structural steel, 5,400 pounds: 10 cents per pound.
Roofing, 16 squares: $19 per square.
Millwork, etc., lump sum, $580.

This bid was considered unreasonably high and was rejected. The work was then subdivided into four divisions and readvertised. Bids were opened March 5, 1907, as follows:

Bids opened March 5, 1907, for canals and structures, Buford-Trenton project, North Dakota.

[Specifications No. 127.]

DIVISION A.

Penson & King, Williston, N. Dak.; total, $20,867.

Excavation, class 1, 32,000 cubic yards: 23½ cents per cubic yard.
Excavation, class 2, 100 cubic yards: 75 cents per cubic yard.
Excavation, class 3, 25 cubic yards: $1.50 per cubic yard.
Excavation, class 4, 25 cubic yards: $2.50 per cubic yard.
10-second-feet canals, 1 linear mile: $340.
5-second-feet canals, 9 linear miles: $320 per linear mile.
Waste-water ditches, 3 linear miles: $260 per linear mile.
Overhaul, 10,000 cubic yards: $0.035 per cubic yard.
Puddling, 25 cubic yards: $1 per cubic yard.
Riprap, 80 cubic yards: $4 per cubic yard.
Concrete, class 1, 40 cubic yards: $9 per cubic yard.
Concrete, class 2, 110 cubic yards: $13 per cubic yard.
Sheet piles, delivered, 2,500 feet B. M.: $50 per M feet B. M.
Sheet piles, driving, 800 linear feet: 50 cents per linear foot.
Bridges, 22-foot span, 2 complete: $375 each.
Bridges, 20-foot span, 3 complete: $350 each.

Bridges, 18-foot span, 1 complete: $320.
Bridges, 16-foot span, 1 complete: $265.
Bridges, 12-foot span, 1 complete: $210.
Bridges, 10-foot span, 1 complete: $165.
Bridges, 8-foot span, 1 complete: $130.
Flumes at Sixmile Creek, lumber, class 1, 2,220 feet B. M., at $80 per M feet B. M.
Structural steel, 4,750 pounds, at 8½ cents per pound.
Culverts, lumber, class 2, 3,000 feet B. M., at $60 per M feet B. M.
Turnouts and drops, lumber, class 1, 14,000 feet B. M., at $80 per M feet B. M.
Wooden gates, surfaced, lumber, class 1, 1,000 feet B. M., at $90 per M feet B. M.
Stop planks, 60, at 80 cents each.
Preserving lumber, 5,000 feet B. M., at $15 per M feet B. M.
Terra-cotta pipe culverts, 12 inches, 4-foot cut or less, 100 linear feet, at $2.25 per linear foot.
Terra-cotta pipe culverts, 15 inches, 4-foot cut or less, 100 linear feet, at $2.75 per linear foot.
Terra-cotta pipe culverts, 18 inches, 4-foot cut or less, 200 linear feet, at $3.40 per linear foot.

DIVISION B.

No bids received.

DIVISION C.

James Burton, Delhi, Iowa; total, $13,282.50.

Pressure pipe, trenching and backfilling, 5,000 cubic yards: 60 cents per cubic yard.
Riprap, 10 cubic yards: $3.50 per cubic yard.
Concrete, class 2, 880 cubic yards: $11.50 per cubic yard.
Sheet piles, delivered, 1,500 feet B. M.: $30 per M feet B. M.
Sheet piles, driven, 200 linear feet: 30 cents per linear foot.
Preserving lumber, 1,500 feet B. M.: $15 per M feet B. M.

DIVISION D.

John S. Penson, Williston, N. Dak.; $3,333.

Excavation, 130 cubic yards: 50 cents per cubic yard.
Concrete, class 1, 145 cubic yards: $10.50 per cubic yard.
Lumber, class 2, 5,500 feet B. M.: $65 per M feet B. M.
Sheet piles, delivered, 2,000 feet B. M.; $50 per M feet B. M.
Sheet piles, driving, 450 linear feet: 50 cents per linear foot.
Structural steel, 5,400 pounds; 8½ cents per pound.
Roofing, 16 squares; $14 per square.
Preserving lumber, 2,000 feet B. M.: $15 per M feet B. M.
Millwork, hardware, painting woodwork, lump sum, $350.

Contracts have been entered into in accordance with the above proposals.

EXPENDITURES.

The expenditures on this project to June 30, 1907, are summarized in the following table:

Expenditures, according to physical features, on Buford-Trenton project, North Dakota, to June 30, 1907.

Features.	Engineering and administration.	Building.
Incidental structures:		
Office building		$770.36
Stable		377.41
Ice house		55.68
Engineer's cottage		1,075.74
Water system		413.49
Equipment (not charged to any particular feature)	$2,924.66	
Headquarters mess and corral		
Inventory	38.48	

Expenditures, according to physical features, on Buford-Trenton project, North Dakota, to June 30, 1907—Continued.

Features.	Engineering and administration.	Building.
Irrigation structures:		
Canals and structures, division A	$2,393.37	$3,485.05
Canals and structures, division B	2,362.86	272.60
Settling basin, division B	174.59	654.75
Pressure pipe, division C	647.71	1,433.61
Pumping station, division D	776.66	1,481.12
Pumping barge, intake station	2.45	.....
Transmission line	131.74	.....
Real estate	.....	760.19
Inventory, cement	.....	2,513.85
Inventory, steel	.....	2,095.53
Irrigable lands:		
Farm unit subdivision and soil examination	.....	90.73
Examination of project as a whole	7,732.06	.....
Administration of project as a whole	5,990.49	.....
Total	23,175.07	15,480.11
Grand total	$38,655.18	

Total expenditures, according to purpose and nature, on Buford-Trenton project to June 30, 1907.

[Total, $38,655.18.]

	Services.	Traveling.	Subsistence.	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination	$4,743.09	$646.10	$842.24	$1,835.23	.....	$305.93	$113.76	$211.45	.....
Survey	5,627.75	696.34	2,140.60	1,212.29	$1.29	771.23	76.00	699.00	.....
Design	3,022.13	123.14	41.67	30.59	.....	41.81	48.43	.....	$9.00
Subdivision	75.95	24.23	.....	.....	.....	.02	.09	.....	.....
Building:									
Rights and property	116.92	66.40	.....	.....	712.50	.30	.....	.....	.....
Building	2,632.77	38.60	474.34	818.94	1,597.52	830.40	.52	139.08	2,083.04
Administration	4,789.02	357.83	14.04	60.48	4.00	570.68	208.41	.....	.....

NESSON PROJECT.

The main facts relating to the Nesson project are summarized below:

Summary of principal data relating to Nesson project.

Counties: Williams and McKenzie.
Latitude: 48° 10′.
Longitude: 103° 5′.
Altitude: 1,850 feet.
Railway connections: Great Northern Railroad about 15 miles north.
Principal markets: St. Paul, Minneapolis, Duluth, Chicago, and Williston.
Land office for district: Williston.
Irrigable area: Bench and cleared bottoms, 16,500 acres; brush bottoms, 2,000 acres.
Average elevation: 1,850 feet.
Character of soil: Benches and cleared bottoms, sandy loam; brush bottoms, sandy.
Range of temperature: Williston) Maximum, 107°; minimum, —54°.
Average rainfall: (Williston) 15 inches.
Total area of irrigable lands: State and school, 5,600 acres; private, 13,000 acres.
Size of farm unit: 160 acres.
Principal products: Wheat, flax, oats, vegetables; under irrigation, alfalfa, sugar beets, and small fruits.

Duty of water: 2 acre-feet per acre per annum.
Source of supply: Missouri River.
Minimum discharge: 10,000 second-feet.
Canals and laterals: 50 miles.

Preliminary surveys and investigations of lignite coal deposits were begun on this project in September, 1904. Detailed surveys were continued during the season of 1905, and a preliminary outline covering plans and estimates was considered by a board of engineers which met at Williston, September 22, 1905. At that time it was recommended that $625,000 be set aside conditionally for the Nesson project on the assumption that ultimately the project would comprise 25,000 acres of land.

Owing to difficulties encountered in securing the necessary action on the part of the land owners to insure the return to the reclamation fund of the money required for the construction of irrigation works no construction work has yet been undertaken, and the probable sum needed to carry to completion the initial unit of this project has not yet been determined.

The area now under consideration for initial development comprises about 16,500 acres. About 12,000 acres lie on the north side of Missouri River 14 miles south of Wheelock, the nearest station on the Great Northern Railroad. The remaining 4,500 acres are on the south side of the river, and will probably be traversed by an extension of the Northern Pacific Railroad now under survey.

The surveys made during 1905 were confined to the lands on the north side of the river, and the earlier plans and estimates contemplated locating a main steam pumping plant on the left bank of the river in the vicinity of the Nesson post-office. Investigations for lignite coal for fuel for the plant disclosed the existence of a workable vein about 2½ miles north of the proposed pumping plant. Surveys made during 1906 covered the large river bottom opposite Nesson, which extends up the river about 10 miles. The coal investigations of the same year were directed to the outcrops in the bluffs adjacent to this bottom. Extensive lignite deposits were found at points within a few hundred feet of the proposed pumping plant and main canal which would be required for irrigating the lands on the south side of the river.

It has therefore been tentatively concluded to build a main electric generating plant at the upper end of the south bottom, where lignite for fuel can be mined close at hand, and water for the boiler plant and condensing apparatus can be obtained conveniently from the river or the south side canal.

In this station steam pumping units would take water from the river and deliver it into the south side canal for the irrigable lands on the south bottom. The plant would consist chiefly of electric generating apparatus for supplying power to the pumping plants located on the north bank of the river near Nesson post-office, about 10 miles distant. Two or more stations, all containing electrically operated centrifugal pumps, would be required—one to consist of a floating barge carrying the pumps, which would take water from the river and discharge it into a settling basin; the other to be permanent buildings, containing the pumps required to lift the water from the settling basin, or low line canals, to other canals at higher elevations.

The pumping lift for the bottom lands on each side of the river would be 30 feet at average low water, and additional lifts of 40, 80, and possibly 100 feet would be required to deliver the water to the bench lands.

A soil survey made in July, 1906, showed that the soil throughout is exceptionally good and relatively free from alkali. The soil of the bottoms is a light sandy loam; that on the benches is free from an excess of adobe, or clay, and is generally a rich sandy loam.

Detail plans and comparative estimates of the alternative propositions will be made during the coming year, and the landowners in the area selected for irrigation under the initial installation will be given an opportunity to hold an election for the purpose of perfecting their contract. Contracts for machinery, canal system, and buildings, if made during 1908, would enable the system to be completed in 1909 and water to be delivered for the irrigating season of 1910.

The expenditures on this project to June 30, 1907, are summarized in the following tables:

Total expenditures, according to purpose and nature, on Nesson project to June 30, 1907.

[Total, $15,510.94.]

	Services.	Traveling.	Subsistence.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:								
Examination	$3,123.16	$430.78	$481.03	.....	$214.10	$101.09	$187.03	.....
Survey	3,289.17	530.48	1,036.14	1.29	294.42	146.24	542.69	$9.00
Design	1,434.31	144.72	.65	2.30	31.03	.....	.....	.10
Subdivision	54.81	19.39	.....	.....	.....	.....	.....	.....
Building:								
Rights and property	120.00	50.17	.....	.....	.....	.....	.....	.....
Building	.60	.12	.....	.....	.04	.....	.....	.....
Administration	2,321.04	380.88	39.96	.....	374.96	139.24	4.00	.....

PROPOSED BISMARCK PROJECT.

The surveys on this project were described in the Fourth Annual Report of the Reclamation Service, pages 287 to 289. The lands to be irrigated under the Bismarck project are in township 138 north, range 80 west, and can only be irrigated by pumping from Missouri River. The acreage of reclaimed land will depend on the heights to which it is feasible to pump the water. The lower lifts should be developed first. An essential factor of this project is the lignite coal beds which underlie large portions of the State and which should be developed on a commercial scale near this project in order to insure the economy and permanence of the irrigation system. The systematic investigation of the coal deposits in this immediate neighborhood has not yet been undertaken. The irrigable lands are well situated near the city of Bismarck and on line of the Northern Pacific Railway.

The net expenditures on this project to June 30, 1907, were **$14,196.61.**

PROPOSED LITTLE MISSOURI PROJECT.

A reconnaisance of this project was made in 1904, which is described in the Third Annual Report, pages 435 to 438.

The unregulated flow of the Little Missouri is not sufficient for irrigating much land, and the examination made did not disclose suitable storage sites. The possible canal lines would involve a prohibitory expense for construction. No further work has been done on this project except stream measurements.

The net expenditures on this project to June 30, 1907, were $5,889.65.

NORTH DAKOTA–MONTANA.

LOWER YELLOWSTONE PROJECT.

GENERAL STATEMENT.

The general features of the Lower Yellowstone project are summarized below:

Summary of principal data relating to Lower Yellowstone project.

Counties: Dawson, Montana; McKenzie, North Dakota.
Townships: 18 to 26 north, Montana; 150 to 152, North Dakota; ranges 56 to 60 east, Montana; 104 west, North Dakota.
Latitude: 47°.
Longitude: 104°.
Altitude: 1,865 to 1,980 feet.
Railway connections: Glendive and Mondak, Mont. Country road extends from Glendive to Mondak.
Principal markets: Minneapolis, St. Paul, and local.
Land offices: Miles City for Montana, Williston for North Dakota.
Irrigable area: Extends from a point 18 miles northeast of Glendive, along the west side of the Yellowstone River to its mouth, opposite Buford, N. Dak., the width running from one-half to 5 miles. Public, 19,551 acres; State and school, 2,150 acres; railroad, 5,584 acres; other private, 39,236 acres.
Character of soil: Deep sandy loam.
Range of temperature: Maximum, 107°; minimum, —49°.
Average rainfall: 16 to 20 inches.
Size of farm units: Private lands, 160 acres; public (not decided).
Value of irrigated lands: $60 to $80 per acre.
Principal products: Forage crops.
Duty of water: 1 second-foot per 100 acres.
Watershed area: 66,000 square miles.
Average annual discharge: 16,900 second-feet, April to November, inclusive, for 1903 to 1906.
Diversion dams: Timber covered, rock-filled weir, pile-foundation, 700 feet long, 12 feet above bed of stream, width 50 feet.
Canals: Main canal, 67 miles long; laterals, 207 miles in length.
Power developed: 290 horsepower.
Pumping station: Direct connected turbine to centrifugal pump, dropping 86 second-feet 29½ feet, lifting 34 second-feet 31½ feet.

HISTORY OF EXAMINATION.

This project was first visited in July, 1903. As considerable irrigable land was found in Montana, as well as in North Dakota, and as the Yellowstone River furnishes an ample water supply for the land in both States, it was decided to make a preliminary survey, starting at Terry, Mont., 40 miles above Glendive, to determine if all the land in the Yellowstone Valley from that point to Missouri River could be reached by a gravity canal. Surveys of this portion began in August, 1903.

It was soon found that the light fall of the Yellowstone River and the high elevation of the land above the river made it impracticable to cover any land above Glendive, so the surveys for a canal heading

at Terry were abandoned and another survey was begun for a canal heading 2 miles above Glendive. This line was continued to Missouri River and covered over 70,000 acres of land. From this survey estimates were worked up, and it was found that the cost was prohibitive, but from this survey sufficient data were obtained to make it appear that it would be feasible to take out a canal some 18 miles below Glendive.

Consequently, in April, 1904, a board of consulting engineers visited the project and left instructions to have the canal surveyed, the amount of land under it ascertained, and a preliminary estimate of cost worked up. The consulting engineers visited the project, examined the plans and estimates, and gave instructions to obtain sufficient data to enable detailed plans and specifications to be made preparatory to building the work. This information was obtained during the season of 1904, and plans and specifications were prepared in Denver, Colo., during the winter of 1904–5. The construction of the project was authorized on May 10, 1904. Proposals were requested in April and opened on June 1, 1905, for the first 34 miles of the main canal.

The headquarters office of this project is located at La Mesa, 32 miles from Glendive and 14 miles from the dam. In addition, six camps are maintained, from which the construction of the canal is supervised.

It is expected that the entire project, with the exception of the laterals for 18,000 acres of land, will be completed in 1908 and water turned on in the spring of 1909. The total amount allotted to date for the construction of this project is $2,700,000. This project and work thereunder have been fully described in preceding annual reports, so that it is necessary now to note only the progress under the various contracts.

In the following table are listed the contracts entered into for building work. This list includes all contracts for excavation, embankment, masonry and erection of structures, but does not include materials such as cement, steel, timber, etc.:

Contracts for building work on Lower Yellowstone project to June 30, 1907.

No. of contract.	Contractor.	Feature.	Estimated total value.	Payments to June 30, 1907.	Per cent paid.
46	Widell-Finley Co.[a]	Canal, division 1	$163,368.00	$34,829.05	21
48	Chas. Stabern	Structures, divisions 1, 2, 3	104,276.00	45,558.21	44
49	Deadwood Construction Co.	Structures, division 4	28,143.00	26,357.59	94
50	E. A. Hess	Telephone	14,939.00	15,556.60	100
78A	John A. Nelson	Laterals	252,770.00	58,549.42	23
82	Nohle & Mann	Lateral "N"	5,727.50	5,314.08	93
99	Henry C. DeLaney	Main canal, division 4	88,091.00	41,382.66	47
106	D. H. Freeman & Co.	Main canal, division 2	251,516.00	189,124.08	75
109	John A. Nelson	Main canal, division 8	29,983.00	9,975.03	33
110	D. H. Freeman & Co.	Main canal, division 1	205,115.00	57,901.14	26
115	Newman & Hoy	Main canal, division 3	245,038.00	50,850.25	21
116	James Munn	Structures and laterals	205,815.00	43,722.42	21
133	Pacific Coast Construction Co.	Dam	142,825.00	27,343.80	19
157	A. J. Coates & Co	Laterals and waste ditches	112,011.00	23,201.24	19
161	Pittsburgh Manufacturing Co.	Sluice gates	2,699.00		0
162	....do	Sluice gates for turn-outs	4,895.00		0
167	D. H. Freeman & Co.	Laterals and waste ditches	25,206.00	1,427.49	6

[a] Contractor in default; work relet, now done by D. H. Freeman & Co.

MAIN CANAL AND LATERALS.

Work under the contract with D. H. Freeman & Co., St. Cloud, Minn., for division 1, schedule A, of main canal was 31.4 per cent completed June 30, 1907. Progress is slow and better time must be made if the work is to be completed on contract time, January 1, 1908.

Good progress is being made by the same company on its contract for division 2, 62.8 per cent of the work having been completed June 30, 1907, and it is possible that all the work will be completed on December 1, 1907.

Work under contract with Newman & Hoy for division 3 is progressing slowly, only 23 per cent having been completed by June 30, 1907. The time of completion is March 1, 1908.

Work on contract of Henry C. DeLaney for division 4 of the same work is also progressing slowly, 52.2 per cent of the work having been completed June 30, 1907. The time of completion stipulated in the contract is December 1, 1907.

Fair progress is being made on work under contract of John A. Nelson for divisions 5, 6, 7, and 9, and laterals A to M, except F. On June 30, 1907, only 28.9 per cent had been completed, however, and the work can not possibly be completed by the time agreed upon, September 1, 1907.

Work under contract of John A. Nelson for division 8 and laterals F, O, and P should also have been completed by September 1, but on June 30 only 41.5 per cent had been completed. Progress is slow.

All work on contract of Nohle & Mann for construction of lateral N has been completed.

LATERALS AND WASTE DITCHES, HEADWORKS TO NEWLON.

Formal bids for this work were called for, to be opened December 15, 1906, but only one bid was received, it being for the work covered by schedule 2. This bid was considered excessive and rejected, and informal proposal for doing the work covered by schedule 1 was obtained from D. H. Freeman & Co., and on May 11, 1907, contract was entered into with that firm at a price of $25,205.50. Fair progress is being made under this contract, but up to June 30 only 6.3 per cent of the work had been completed. The time of completion specified in the contract is January 1, 1908.

On March 2, 1907, a satisfactory informal proposal for doing the work covered by schedules 2 and 3 was obtained from Arthur J. Coates & Co., of St. Cloud, Minn., the prices being $69,872.50 for schedule 2, and $42,138.50 for schedule 3, and contract was entered into with that company. Excellent progress is being made, and on June 30, 1907, 23 per cent of the work had been completed. Contract will be finished in advance of the time named, September 1, 1908.

CULVERT DRAINS, DIVISIONS 5 AND 6.

In May, 1907, proposals were requested for constructing culvert drains in divisions 5 and 6. Two bids were received, the lower one being that of John A. Nelson, of Sidney, Mont., $5,905.50. Contract will be entered into with Mr. Nelson in the near future.

LOWER YELLOWSTONE DAM.

This structure will be 700 feet long, 12 feet high above the bed of the stream and 50 feet through, and will contain 12,600 linear feet of round piling, 725,000 feet of lumber, and 90 tons of iron and steel.

On September 21, 1906, contract was awarded to the Pacific Coast and Construction Company, Portland, Oreg., for constructing this dam. On June 30 only 24 per cent of the work had been completed, but it is expected that the contract will be finished on time, February 1, 1909.

STRUCTURES.

The contract of Charles Stabern for construction of divisions 1, 2, and 3 was on October 26, 1906, taken over by the sureties on his bond, as Mr. Stabern's health failed, and it was found that he could not carry on the work satisfactorily. They are now proceeding with the work, and on June 30 had completed 54.4 per cent. Progress is slow, and the work will not be completed on time, September 1, 1907.

Division 4 is covered by contract with the Deadwood Construction Company, Deadwood, S. Dak., dated July 17, 1905. In view of adverse weather conditions the time of completion of the contract was extended to May 31 and again to July 31, 1907. On June 30, 95 per cent of the work had been completed.

August 7, 1906, contract was entered into with James Munn for structures, divisions 5 to 9, and laterals A to P. On June 30, 1907, 23.6 per cent of the work had been completed. Progress is slow, and it is not probable that the work will be completed by December 1, 1907, the date of termination of the contract.

Proposals for construction of the structures from the headworks to Newlon were opened December 15, 1906, and were rejected as being excessive. Advertisements for bids, to be opened March 2, 1907, resulted in no proposals being submitted. Contract was subsequently awarded to James Munn on an informal proposal and an agreement was entered into on August 20, 1907.

TELEPHONE LINE.

A telephone line has been completed by E. A. Hess, under contract dated June 28, 1905, the cost being $15,556.

CEMENT AND STEEL.

On August 18, 1905, contract was made with the Illinois Steel Company, Chicago, Ill., for furnishing 12,000 to 16,000 barrels of Portland cement at $1 per barrel f. o. b. cars, South Chicago, Ill.

April 23, 1906, another contract was made with the same company for 8,000 to 12,500 barrels at $1.60 per barrel f. o. b. cars, South Chicago, Ill. Most of the cement under this contract has been delivered, and it is thought that all will be used before November 1, 1907.

Formal advertisement was issued requesting proposals for furnishing 600,000 pounds of square steel bars with reenforcement of concrete, bids to be opened August 21, 1905, but no bids were received. The material thereupon was obtained in Chicago, 60 tons being purchased from the Inland Steel Company at $1.65 per hundred pounds, and 53 tons from the Carnegie Steel Company at $1.515 per hundred pounds.

GATES AND LIFTING DEVICES.

After circular advertisement for bids eleven 5-foot circular sluice gates were purchased from the Chapman Valve Manufacturing Company, of Indian Orchard, Mass., the price being $800 each f. o. b. cars, Glendive, Mont. The delivery of the gates was completed in January, 1906.

On December 28, 1905, bids for furnishing eight lifting devices for sluiceways were requested of nine different companies, but no bids were received. On November 12, 1906, letters were sent to seven manufacturing companies again requesting bids. The only proposal received was from the New Jersey Foundry and Machine Company, at $375 each, and this bid was accepted.

On November 14, 1906, letters were sent to various companies requesting bids for furnishing gates for lateral turn-outs. The lowest bidder was the Pittsburg Manufacturing Company, Pittsburg, Pa., and contract was entered into with that company on April 19, 1907, the amount being $4,895.06 f. o. b. cars, Mondak, Mont.

On December 29, 1906, bids for furnishing gates for sluiceways were requested by circular letter. Four bids were received, the lowest being that of the Pittsburg Manufacturing Company, $2,698.50; this bid was accepted and contract entered into April 19, 1907.

FORCE ACCOUNT WORK.

Some force account work has been done, including construction of the Collins, Hell, and Squaw flumes, at a cost of $3,084.50 and construction of bridges for laterals at a cost of $4,024.21.

HIGHWAY BRIDGES.

Bids for construction of highway bridges were opened April 25, 1907, and contract has been entered into with A. Y. Bayne & Co., of Minneapolis, Minn., for construction of three of these bridges.

IRRIGABLE LANDS.

Yellowstone River at its lower course has eroded a broad valley and built up a series of level or gently sloping terraces. These terraces vary in width from one-half mile or less at the southern or upper end of the project to 4 or 5 miles in its broadest portion, There are generally two well-defined terraces, the height varying from 4 or 5 feet to 50 or 60 feet. The lower ones are subject to occasional overflow and possess the typical characteristics of alluvial flood plains. The lower flats are partly wooded, and their surface is slightly irregular. Small hummocks and kettle holes are common, making the surface slightly uneven, though in general it is rather level. The second or intermediate terrace, where such occurs, is similar to the first, except that it is less liable to inundation and is generally smoother and freer from heavy vegetation. The upper bench is of a different type from the lower ones; it is smooth of surface and entirely free from heavy vegetation. Unlike the lower terraces, it has a decided slope toward the stream. At its upper edge this slope is quite marked, gradually decreasing toward the east until at the edge of its bounding terrace the surface is nearly level.

SOILS.

Compared with other localities of equal area the Lower Yellowstone Valley possesses soils of great uniformity. Certain variations in texture and condition are found, but these differences give rise to less variations in productiveness than would be expected. Few light soils are found, and practically none which could be called thin and infertile.

These soils fall naturally into three main types: The first and most important of these types is that on the higher terraces and often the lower terraces of the valley. The soil is of a deep loam or clay loam of a rich brown color, due to the presence of high percentage of organic matter. Its mechanical composition makes it strong and retentive of moisture, while at the same time it works up into a good tilth upon cultivation, plowing easily, and responding quickly to tillage without baking or forming clods.

The surface foot of the soil proper is frequently underlain by material slightly heavier and more compact. A subsoil of clay loam extends to a depth of 6 or 8 feet in places, though as a rule lighter material is found 3 or 4 feet below the surface.

On account of its elevation above the river and the good slope riverward which generally characterizes the surface of the upper benches, this type of soil is naturally well drained. This, together with the porous character of the deeper underlying strata, should make artificial drainage unnecessary.

In the river bottoms there is more variation in the character of the soil than is found upon the high benches. There are two types of these soils, the one a rather light, and the other a heavy type. Together they cover a comparatively small portion of the area of the project. The lighter of these soils is a fine, sandy loam, light brown in color, and with a depth varying from 1 to 6 feet or more.

The heavier type, or bottom-land soil, prevails in the lower portion of the valley. This soil is of a dark brown, or nearly black, loam or clay, with a depth varying almost directly with its relative distance from the river. In places it forms a comparatively thin veneering a foot or 18 inches deep, resting upon beds of fine sandy loam or sand. Again, in the lower areas it is a sticky clay loam or clay with a depth of 4 to 6 feet. It is nearly black with organic matter and is exceptionally heavy and impervious. Upon drying it cracks at the surface, but it possesses the peculiar property often found in these soils of crumbling or slacking upon drying out. This is an advantageous feature, rendering the soil more tractable under cultivation.

This soil possesses almost exhaustless fertility. Except in a few areas along the foot of a terrace no accumulations of alkali were found, and here the amount was so small as not to be serious.

COST OF CLEARING AND PREPARING LAND FOR IRRIGATION.

Probably few areas of equal size could be found in the irrigable districts in the West where the land will require so little clearing and smoothing to prepare it for the application of water. The higher benches, and in most cases the second bottoms, can be prepared for *irrigation* with a minimum expenditure of labor.

The surface is generally smooth and gently sloping, with about the desirable fall for easy irrigation. Irregularities of surface are remarkably few upon this higher bench, and though in places the surface is broadly and gently undulating, it is free from minor irregularities that cause the greatest trouble in flooding. Grass is the only vegetation, and in many cases the only preliminary labor required of the irrigator will be the running of his ditches and small laterals, and the building of checks, if such are required.

The land that will require clearing is of two classes: (1) That covered by buck brush, wild rose, and small shrubbery of various kinds, and (2) that which supports a heavy growth of willows, cottonwood, ash, etc. Of these, the first class presents no serious problem. Where the growth is chiefly buck brush and wild rose it can be mown either with a brush scythe by hand or by the use of a special brush-cutter bar on an ordinary mowing machine. A cheap, but somewhat dangerous, method of getting rid of this brush is by setting fire to it in the late summer when it is dry. If there is nothing in the line of timber worth saving and care is taken to prevent disastrous spreading, this is an excellent method of clearing. The land which is covered by heavy timber presents a more difficult problem. Such land is confined to the lowest river bottom when the timber is composed of cottonwood, willow, elm, ash, box elder, etc. In the upper portion of the valley box elder and willow predominate, while in the lower portion ash, elm, and box elder are mixed with the cottonwood and willow. To clear such land rapidly will require a great deal of labor, and if fire were used a great deal of material valuable for building logs, fence posts, and firewood would necessarily be destroyed. It is difficult to estimate the cost of clearing such land. The value of the material cut off would enter as an element in reducing the net cost, but if the land were all cleared rapidly there would necessarily be considerable waste of valuable material. However, if time were taken and economy practiced, so as to save all useful wood, the land could be cleared in the course of a few years in such a way as to make the timber, fence posts, firewood, etc., pay the cost of clearing. With a large body of land to be fenced and many buildings to be built, timber of any character should find a ready market at highly profitable prices in a country so remote from sources of lumber.

AGRICULTURAL METHODS AND CROPS NOW GROWN.

Very little farming has been done in the upper portion of the valley, but on the broad benches north of Fox Creek, between Newlon post-office and Missouri River, dry farming has been in the past few years generally practiced. But this has been preeminently a stock country, and agriculture is still in the experimental stage.

The crops chiefly grown are oats, barley, Indian corn, wheat, and potatoes, with some flax and speltz. Oats are by far the most extensively grown of all the crops and seem to do fairly well. From year to year they yield about 15 to 20 bushels per acre, with occasional yields in exceptional seasons of 50 bushels. Several varieties of wheat are sown, but the one best adapted to the climate is the macaroni variety. Flax also produces fair returns, from 10 to 15 bushels per acre being the average yield in good seasons.

Where natural depressions occur or where seepage produces a moist condition of the soil, fair crops of wild grass are cut every year. Where average conditions prevail, about one-quarter of a ton of hay per acre is cut.

Though in exceptional seasons, like the year 1905–6, good profits were realized from this method of dry farming, it can hardly be considered a paying industry.

EXPENDITURES.

The expenditures on this project to June 30, 1907, are summarized in the following table:

Expenditures, according to physical features, on Lower Yellowstone project to June 30, 1907.

	Engineering and administration.	Building.
Incidental structures:		
Telephone line	$3,105.68	$15,422.44
Camps and headquarters	17,059.39	.....
Irrigation structures:		
Division 1, schedule A	12,694.19	83,325.00
Division 2, schedule A	13,931.54	135,211.53
Division 3, schedule A	8,465.57	32,549.33
Division 4, schedule A	9,129.66	35,023.25
Divisions 5, 6, 7, 9, and laterals	12,802.32	47,068.85
Division 8 and laterals F, O, and P	1,596.30	9,645.22
Lateral N	237.47	4,275.11
Laterals and waste ditches, schedule 1	371.04	1,427.49
Laterals and waste ditches, schedules 2 and 3	2,290.60	11,095.27
Lower Yellowstone dam	2,827.70	26,891.03
Divisions 1, 2, and 3, schedule B	7,381.73	42,033.54
Division 4, schedule B	5,017.90	23,094.79
Divisions 5 to 9, schedule B	11,673.62	33,053.39
Structures, headworks to Newlon	110.24	687.98
Highway bridges	123.09	.....
Structures, force account	3,884.50	.....
Bridges, force account	5,005.31	.....
Inventory, cement	.....	35,829.84
Inventory, steel	.....	13,853.33
Inventory, sluice gates	.....	8,797.25
Irrigable lands:		
Real estate	4,634.64	.....
Soil survey	1,890.55	.....
Land survey	10,501.66	.....
Examination:		
Lower Yellowstone	7,378.49	.....
North Dakota	1,798.58	.....
Fallon	596.78	.....
Preliminary investigations	9,237.92	.....
Stream gaging	106.23	.....
Laboratory	110.00	.....
Survey:		
Mapping irrigable lands	5,890.00	.....
Testing canal line	2,383.71	.....
Canal and dam topography	2,700.76	.....
Canal line location	13,447.66	.....
Lateral location	4,145.00	.....
Administration:		
General expense	66,513.30	.....
Total	249,043.13	559,304.64
Grand total	808,347.77	

Total expenditures, according to purpose and nature, on Lower Yellowstone project to June 30, 1907.

[Total, $808,347.77.]

	Services.	Traveling.	Subsistence.	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination	$13,681.90	$5,717.32	$1,781.03	$3,861.73	.....	$444.21	$7.61	$501.26	$1.82
Survey	18,473.33	2,120.30	4,176.89	6,280.70	.....	1,742.24	13.78	1,484.11	.....
Design	9,480.13	178.36	87.23	181.95	.....	103.60	57.51	.....	170.04
Subdivision	9,344.06	192.95	45.68	114.20	.....	1,033.35	4.84	285.60	.....
Building:									
Rights and property	504.67	336.45	29.00	.....	.....	3,726.05	.....	6.15	.....
Building	82,260.43	2,497.06	6,580.27	9,052.83	$38,632.51	10,923.97	278.53	8,645.64	524,974.88
Administration	29,059.12	2,782.21	435.71	1,053.23	.....	4,110.96	467.58	422.79	.....

IRRIGABLE AREA.

The irrigable land is divided into two separate tracts by Cimarron River. North of the Cimarron there are about 2,000 acres of land in Oklahoma which could be covered by a small plant placed near the river. In case the project should be extended into Kansas 2,000 or 3,000 acres more could be covered by a new canal. On the south side of the Cimmaron there are three irrigation ditches which can be supplied with water from pumps placed near their heads. By the extension of one of these ditches 10,000 to 14,000 acres could be irrigated on the south side of Cimarron River. The average elevation of this land is about 1,950 feet above the sea. All of the irrigable land is in private ownership. A total area of more than 15,000 acres could probably not be reached by the existing canals or by a reasonable extension of them.

PLAN OF IRRIGATION.

On account of the insufficient water supply of the Cimarron River it will be necessary to supply the existing ditches and the proposed new ditch to be constructed on the north side of the river with water obtained from the underflow of the river by pumping from suitably constructed wells. It will be necessary to construct a power house at a central location and transmit the power electrically to about four separate pumping stations. Detailed plans and estimates for this project will not be completed until January, 1908.

EXPENDITURES.

The net expenditures on this project to June 30, 1907, were $2,247.

only investigations that have been conducted are in connection with determining the available water supply. These data are being secured by gage readings and discharge measurements made by the Water Resources Branch of the United States Geological Survey on Elk Creek, at Hobart; North Fork of Red River, at Granite and Headrick; Elm Fork of Red River, at Mangum, and Otter Creek at Mountain Park.

The net expenditures on this project to June 30, 1907, were $57,745.

CIMARRON PROJECT.

GENERAL STATEMENT.

The principal data relating to the Cimarron project are summarized below:

Summary of principal data relating to Cimarron project.

State: Oklahoma.
Counties: Beaver and Woodward.
Latitude: 37°.
Longitude: 100°.
Townships: 5 and 6 north, range 28 east, Beaver County; townships 28, 29 north, ranges 24–26 west, Woodward County.
Irrigable area: 10,000 to 14,000 acres.
Duty of water: 2-acre feet per acre per annum.
Average rainfall: 20 inches.
Range of temperature: Maximum, 110°; minimum, —20°.
Average elevation: 1,950 feet.
Principal products: Wheat, alfalfa, broom corn, cotton.
Nearest railroad: Atchison, Topeka and Santa Fe.
Nearest station: Englewood, Kans.
Principal markets: Wichita, Kans., and Kansas City, Mo.
Ownership of lands: Private.
Character of soil: Various; clay loam, sandy loam, and sandy clay.
Value of irrigated land: $30 per acre.

The Cimarron project is located in Beaver and Woodward counties, Okla., and includes two eastern townships and a fractional township in Beaver County, and three western and two northern townships and fractional townships in Woodward County. The nearest railway station is the village of Englewood, Kans., which is located about 2½ miles from the northern boundary line of the State of Oklahoma. The land office of the district is located at Woodward, Okla.

Preliminary work of examination on this project was made during the winter of 1906–7. At this time a contour map of the land south of the Cimarron River was completed and test borings made near the head of the Settlers' ditch for the purpose of determining the character and depth of the water-bearing gravels.

During the field season of 1907 further work has been done in order to complete the map of the land north of the river and to determine the nature of the water bearing gravels at the principal points where this information will be necessary for preliminary plans for the project.

Complete plans and estimates of cost for this project have not yet been submitted, and no water users' association has been organized. The existing ditches are owned by the landowners and the present plans contemplate their use for the Government project.

OKLAHOMA.

RED RIVER PROJECT.

The Fourth and Fifth Annual Reports contain a description in detail of the investigations in connection with the Red River project to June 30, 1906. Since that date, and prior to December 15, 1906, plane-table surveys were continued of irrigable lands in Kiowa County. Canal lines were accurately located and data obtained for more accurately estimating the total cost of a project to irrigate between 80,000 and 100,000 acres of land. The amount of land under this project susceptible of irrigation is far in excess of the available water supply.

It is feasible to store 200,000 acre-feet of water in the Navajo reservoir, but it is doubtful if this is sufficient for the proper irrigation of 100,000 acres. The hydrographic investigations that have been carried on in the drainage of the Red River above the Navajo reservoir site indicate that a more conservative estimate would be for a supply sufficient for 80,000 acres. The detailed estimate of the cost of a project for the irrigation of from 80,000 to 100,000 acres is $3,500,000, or $35 per acre for 100,000 acres and $44 per acre for 80,000 acres. That is believed to be too high a cost per acre for lands which in some years are more than sufficiently supplied with water from natural rainfall.

On account of the tight, clayey subsoil of the lands in Greer County and the resultant difficulty of proper drainage, all lands in that county have been eliminated from the project, and the estimates have been confined to a project for the irrigation of lands in Kiowa and Comanche counties.

In order to determine the extent of water-bearing gravel in Otter Creek and Red River valleys near Snyder, Okla., borings were made in the early spring of 1907, and it was found that it is entirely practicable to construct pumping plants for the recovery of water sufficient for the irrigation of from 100 to 600 acres of land at many points in the Red River Valley. There are some locations in which the sands and gravels are so fine that it would probably not be economical to construct pumping plants. The borings also indicate that it is not feasible to install a large pumping plant in this location to recover a large amount of underground water; in other words, the best method of developing the underground water supply, as indicated by the borings, will be by the installation of a large number of small plants owned by the farmers individually rather than one large plant owned by the community.

All investigations, except hydrographic, and estimates having been completed, the equipment on hand at Snyder was disposed of by sale or transfer, and the office closed April 19, 1907. Since that date the

only investigations that have been conducted are in connection with determining the available water supply. These data are being secured by gage readings and discharge measurements made by the Water Resources Branch of the United States Geological Survey on Elk Creek, at Hobart; North Fork of Red River, at Granite and Headrick; Elm Fork of Red River, at Mangum, and Otter Creek at Mountain Park.

The net expenditures on this project to June 30, 1907, were $57,745.

CIMARRON PROJECT.

GENERAL STATEMENT.

The principal data relating to the Cimarron project are summarized below:

Summary of principal data relating to Cimarron project.

State: Oklahoma.
Counties: Beaver and Woodward.
Latitude: 37°.
Longitude: 100°.
Townships: 5 and 6 north, range 28 east, Beaver County; townships 28, 29 north, ranges 24–26 west, Woodward County.
Irrigable area: 10,000 to 14,000 acres.
Duty of water: 2-acre feet per acre per annum.
Average rainfall: 20 inches.
Range of temperature: Maximum, 110°; minimum, —20°.
Average elevation: 1,950 feet.
Principal products: Wheat, alfalfa, broom corn, cotton.
Nearest railroad: Atchison, Topeka and Santa Fe.
Nearest station: Englewood, Kans.
Principal markets: Wichita, Kans., and Kansas City, Mo.
Ownership of lands: Private.
Character of soil: Various; clay loam, sandy loam, and sandy clay.
Value of irrigated land: $30 per acre.

The Cimarron project is located in Beaver and Woodward counties, Okla., and includes two eastern townships and a fractional township in Beaver County, and three western and two northern townships and fractional townships in Woodward County. The nearest railway station is the village of Englewood, Kans., which is located about 2½ miles from the northern boundary line of the State of Oklahoma. The land office of the district is located at Woodward, Okla.

Preliminary work of examination on this project was made during the winter of 1906–7. At this time a contour map of the land south of the Cimarron River was completed and test borings made near the head of the Settlers' ditch for the purpose of determining the character and depth of the water-bearing gravels.

During the field season of 1907 further work has been done in order to complete the map of the land north of the river and to determine the nature of the water bearing gravels at the principal points where this information will be necessary for preliminary plans for the project.

Complete plans and estimates of cost for this project have not yet been submitted, and no water users' association has been organized. The existing ditches are owned by the landowners and the present plans contemplate their use for the Government project.

IRRIGABLE AREA.

The irrigable land is divided into two separate tracts by Cimarron River. North of the Cimarron there are about 2,000 acres of land in Oklahoma which could be covered by a small plant placed near the river. In case the project should be extended into Kansas 2,000 or 3,000 acres more could be covered by a new canal. On the south side of the Cimmaron there are three irrigation ditches which can be supplied with water from pumps placed near their heads. By the extension of one of these ditches 10,000 to 14,000 acres could be irrigated on the south side of Cimarron River. The average elevation of this land is about 1,950 feet above the sea. All of the irrigable land is in private ownership. A total area of more than 15,000 acres could probably not be reached by the existing canals or by a reasonable extension of them.

PLAN OF IRRIGATION.

On account of the insufficient water supply of the Cimarron River it will be necessary to supply the existing ditches and the proposed new ditch to be constructed on the north side of the river with water obtained from the underflow of the river by pumping from suitably constructed wells. It will be necessary to construct a power house at a central location and transmit the power electrically to about four separate pumping stations. Detailed plans and estimates for this project will not be completed until January, 1908.

EXPENDITURES.

The net expenditures on this project to June 30, 1907, were $2,247.

OREGON.

UMATILLA PROJECT.

GENERAL STATEMENT.

The general features of the Umatilla project are summarized below.

Summary of principal data relating to Umatilla project.

County: Umatilla.
Latitude: 46°.
Longitude: 119°.
Altitude: 470 feet.
Railroad connections: The Oregon Railroad and Navigation Company's main line runs through the project. Its Umatilla-Spokane branch runs along the north side of the project and the Portland-Seattle branch of the Northern Pacific system is just across the Columbia River.
Principal markets: Portland and Spokane.
Irrigable area: South of the Columbia River and east of the Umatilla River; extent, 18,000 acres.
Character of soil: Principally sandy soil of basaltic origin; some volcanic ash.
Range of temperature: Maximum, 115°; minimum, —10°.
Average rainfall: 9 inches.
Ownership of lands: Public, 2,800 acres; estimated amount to be relinquished to the United States, 940 acres; railroad (Northern Pacific), 900 acres; Maxwell Land and Irrigation Company, 5,100 acres; other private lands, 10,700 acres.
Size of farm units: 10 acres within 1 mile from shipping points, 20 acres for land from 1 to 3 miles from shipping points and in the vicinity of the Government town site, and 40 acres for the remainder of the project.
Value of irrigated lands: $150 to $250 per acre.
Principal products: Grain, hay, vegetables, and fruit.
Duty of water: 2.8 acre-feet per acre per annum.
Watershed area: 1,400 square miles above diversion and 210 square miles above storage dam.
Average annual discharge: 600,000 acre-feet at diversion. (Less than 2,000 acre-feet above storage dam.)
Storage reservoir: Area at flow line, 1,500 acres; capacity, 50,000 acre-feet.
Storage dam: One earth fill dam; height, 98 feet; length of top, 3,500 feet; spillway crest, 330 feet long, 8 feet below maintop of dam.
Diversion dam: Low concrete weir 400 feet long on cribwork, with earth and rock fill embankment carried on across the channel 8 feet higher than crest of weir.
Feed canal: 25 miles long; capacity, 300 cubic feet per second; depth, 5.5 feet; bottom width (earth section), 13.9 feet; width at water level, 35.9 feet
Distributary laterals: Carrying from 225 to 50 cubic feet per second, 8 miles; carrying from 50 to 10 cubic feet per second, 50 miles; carrying less than 10 cubic feet per second, 100 miles.
Total pipe lines: 30 inches and greater diameter, 6¼ miles; total pipe lines of less than 30 inches diameter, 2 miles.

HISTORY OF EXAMINATIONS.

In the summer of 1905 a reconnaissance that seemed to assure a feasible project was made of land lying east of Umatilla River and immediately south of Columbia River. During the fall detailed sur-

Following is an abstract of the bids opened September 18, 1906, for construction of the Cold Springs dam:

Bids opened September 18, 1906, for Cold Springs dam, Umatilla project, Oregon.

[Specifications No. 90.]

BIDDERS.

A. Clement, Strange & Salsbury, Salt Lake City, Utah, $339,505; alternate, $345,380.

B. Puget Sound Bridge and Dredging Company, Seattle, Wash., $471,893.55; alternate, $486,743.55.

C. Robt. Wakefield, Portland, Oreg., $489,058.60; alternate, $496,788.60.

ITEM 1.

Excavation for dam embankment, earth, 158,000 cu. yds.:
Bidder A, 29 cents per cu. yd.
Bidder B, 45 cents per cu. yd.
Bidder C, 40 cents per cu. yd.

ITEM 2.

Excavation for dam embankment, gravel, 455,000 cu. yds.:
Bidder A, 35 cents per cu. yd.
Bidder B, 45 cents per cu. yd.
Bidder C, 48 cents per cu. yd.

ITEM 3.

Excavation, class 1, 61,300 cu. yds.:
Bidder A, 40 cents per cu. yd.
Bidder B, $0.6885 per cu. yd.
Bidder C, 75 cents per cu. yd.

ITEM 4.

Excavation, class 2, 19,300 cu. yds.:
Bidder A, 55 cents per cu. yd.
Bidder B, $1.53 per cu. yd.
Bidder C, $1.60 per cu. yd.

ITEM 5.

Excavation, class 3, 3,100 cu. yds.:
Bidder A, $1.25 per cu. yd.
Bidder B, $2.70 per cu. yd.
Bidder C, $2.60 per cu. yd.

ITEM 6.

Riprap, 12,000 cu. yds.:
Bidder A, $2.50 per cu. yd.
Bidder B, $3.375 per cu. yd.
Bidder C, $3.52 per cu. yd.

ITEM 7.

Riprap, 80 cu. yds. (inlet and other work):
Bidder A, $2.50 per cu. yd.
Bidder B, $3.375 per cu. yd.
Bidder C, $3.52 per cu. yd.

ITEM 8.

Rock fill (alternative), 8,000 cu. yds.:
Bidder A, $1.75 per cu. yd.
Bidder B, $2.70 per cu. yd.
Bidder C, $2.66 per cu. yd.

ITEM 9.

Rock fill (alternative), 28,500 cu. yds.:
Bidder A, $1.75 per cu. yd.
Bidder B, $2.70 per cu. yd.
Bidder C, $2.50 per cu. yd.

ITEM 10.

Rock fill, 10,800 cu. yds.:
Bidder A, $1.75 per cu. yd.
Bidder B, $2.70 per cu. yd.
Bidder C, $2.80 per cu. yd.

ITEM 11.

Drainpipe, 6-inch, laid dry, 1,900 lin. ft.:
Bidder A, 55 cents per lin. ft.
Bidder B, 67 cents per lin. ft.
Bidder C, 70 cents per lin. ft.

ITEM 12.

Drainpipe, 8-inch, laid dry, 600 lin. ft.:
Bidder A, 75 cents per lin. ft.
Bidder B, $1 per lin. ft.
Bidder C, $1 per lin. ft.

ITEM 13.

Drainpipe, 8-inch, laid-cement joint, 600 lin. ft.:
Bidder A, $1.20 per lin. ft.
Bidder B, $1.35 per lin. ft.
Bidder C, $1.42 per lin. ft.

ITEM 14.

Concrete, class A, 1,250 cu. yds.:
Bidder A, $7 per cu. yd.
Bidder B, $5.50 per cu. yd.
Bidder C, $8 per cu. yd.

ITEM 15.

Concrete, class B, 500 cu. yds.:
Bidder A, $8 per cu. yd.
Bidder B, $6.50 per cu. yd.
Bidder C, $8 per cu. yd.

ITEM 16.

Concrete, class C, 800 cu. yds.:
Bidder A, $14 per cu. yd.
Bidder B, $10.50 per cu. yd.
Bidder C, $9.75 per cu. yd.

ITEM 17.

Concrete, class D, 560 cu. yds.:
Bidder A, $11 per cu. yd.
Bidder B, $5.70 per cu. yd.
Bidder C, $7 per cu. yd.

All of the above bids were rejected.

DISTRIBUTION SYSTEM.

Following is an abstract of the proposals opened October 1, 1906, for construction of the distribution system:

Bids opened October 1, 1906, for distribution system, Umatilla project, Oregon.

[Specifications No. 114.]

BIDDERS.

A: Thomas Jaques, Pilot Rock, Oreg.; schedule 1, $20,212.50.
B: Puget Sound Bridge and Dredging Company, Seattle, Wash.; schedule 1, $29,535; schedule 2, $29,850. Both schedules or none.
C: Newport Land and Construction Company, Echo, Oreg.; schedule 1, $30,112.50; schedule 2, $30,750. Both schedules or none.
D. E. T. Johnson Company, Portland, Oreg.; schedule 1, $31,020.
E: Seaman Davis Company, Portland, Oreg.; schedule 1, $33,000; schedule 2, $30,000. Both schedules or none.
F: Naylor Norlin Company, Limited, Lewiston, Idaho; schedule 1, $33,000; schedule 2, $34,500.
G: Standard Construction Company, Portland, Oreg.; schedule 1, $41,250; schedule 2, $37,500.

SCHEDULE 1.

Grading for about 15 miles of main and lateral ditches, 150,000 cubic yards, class 1:
Bidder A, 12½ cents per cu. yd.
Bidder B, 17 9/10 cents per cu. yd.
Bidder C, 18¼ cents per cu. yd.
Bidder D, 18 8/10 cents per cu. yd.
Bidder E, 20 cents per cu. yd.
Bidder F, 20 cents per cu. yd.
Bidder G, 25 cents per cu. yd.

SCHEDULE 2.

Grading for about 26 miles of main and lateral ditches, 160,000 cubic yards, class 1:
Bidder B, 19 9/10 cents per cu. yd.
Bidder C, 20½ cents per cu. yd.
Bidder E, 20 cents per cu. yd.
Bidder F, 23 cents per cu. yd.
Bidder G, 25 cents per cu. yd.

Contract for schedule 1 was awarded to Thomas Jaques. Schedule 2 was subdivided into small sections and readvertised. Bids were opened November 30, 1906, and the following is an abstract of the same:

Bids opened November 30, 1906, for schedule 2 of distribution system, Umatilla project, Oregon, being grading for about 26 miles of main and lateral ditches, 134,000 cubic yards, class 1.

BIDDERS.

A: J. H. Strohm, Hermiston, Oreg., $16,513.75. Will take one section or all.
B: Charles H. Skinner, Hermiston, Oreg., $17,480. Will take any part or sections 1, 2, and 3 together for 12 cents, or sections 4, 5, and 6 for 12½ cents per cubic yard.
C: Harvey & Morton, Hermiston, Oreg., $18,410. Will take one or two sections.
D: Wm. Harkins, Weiser, Idaho, $17,700. Will take all or any part.
E: Peterson & Murphy, Grass Valley, Oreg., $18,900. Not to exceed 50,000 yards.
F: R. C. Canfield, Echo, Oreg., $2,100, section 6 only.

GRADING.

Section 1, 23,000 cu. yds.:
Bidder A, 11⅛ cents per cu. yd.
Bidder B, 12 cents per cu. yd.
Bidder C, 12 cents per cu. yd.
Bidder D, 13 cents per cu. yd.
Bidder E, 14 cents per cu. yd.
Section 2, 14,000 cu. yds.:
Bidder A, 16 cents per cu. yd.
Bidder B, 13½ cents per cu. yd.
Bidder C, 12½ cents per cu. yd.
Bidder D, 15 cents per cu. yd.
Bidder E, 15 cents per cu. yd.
Section 3, 32,000 cu. yds.:
Bidder A, 11⅛ cents per cu. yd.
Bidder B, 12⅜ cents per cu. yd.
Bidder C, 12½ cents per cu. yd.
Bidder D, 13 cents per cu. yd.
Bidder E, 15½ cents per cu. yd.

GRADING—Continued.

Section 4, 22,000 cu. yds.:
Bidder A, 11¼ cents per cu. yd.
Bidder B, 12½ cents per cu. yd.
Bidder C, 15 cents per cu. yd.
Bidder D, 12½ cents per cu. yd.
Bidder E, 12 cents per cu. yd.
Section 5, 30,000 cu. yds.:
Bidder A, 11 cents per cu. yd.
Bidder B, 13 cents per cu. yd.
Bidder C, 15 cents per cu. yd.

GRADING—Continued.

Section 5, 30,000 cu. yds.—Continued.
Bidder D, 12 cents per cu. yd.
Bidder E, 12 cents per cu. yd.
Section 6, 14,000 cu. yds.:
Bidder A, 17 cents per cu. yd.
Bidder B, 15 cents per cu. yd.
Bidder C, 15 cents per cu. yd.
Bidder D, 15 cents per cu. yd.
Bidder E, 17 cents per cu. yd.
Bidder F, 15 cents per cu. yd.

Sections 1, 3, 4, and 5 were awarded to J. Herbert Strohm, section 2 to Harvey & Morton, and section 6 to Charles H. Skinner.

Work under two schedules, comprising about 34 miles of laterals, has been completed, which has required the excavation of about 243,000 cubic yards of earth and 1,000 cubic yards of loose and solid rock.

More than half the irrigable land under the project lies on ridges that are separated by low intervening depressions, and a number of pipe lines are necessary. The total length of the larger pipe lines (30-inch to 46-inch diameter) will be more than 6¼ miles. Reenforced-concrete pipe is to be used for these pipe lines, with the exception of a 42-inch pipe 9,800 feet long with a maximum pressure head of 110 feet, which may be built of wood or steel. For pipes of 18-inch diameter or smaller, and under low heads, it is proposed to use concrete tile or vitrified sewer pipe.

All outlets for farm laterals from ditches to be maintained by the Government are estimated on the basis of cement tile or vitrified sewer-pipe turnouts. Outlets that are too large to use 12-inch to 18-inch pipe are to be special concrete structures.

TELEPHONE LINE.

A telephone line for the use of the Reclamation Service connects on one line the Cold Springs dam, the Hermiston and Echo Reclamation offices, the diversion dam, and the central office of the Butter Creek Telephone Company and is to provide telephones on the feed canal, about 3 miles apart. This line is constructed and maintained by the telephone company.

EXPENDITURES.

The expenditures on this project to June 30, 1907, are summarized in the following tables:

Expenditures according to physical features on Umatilla project to June 30, 1907.

Feature.	Engineering and administration.	Building.
Headquarters:		
Office, lodging, and boarding houses	.....	$5,530.81
Irrigation structures:		
Cold Springs dam	$4,386.00	195,139.42
Cold Springs reservior, submerged lands	.....	5,937.33
Distributing system	11,239.00	66,934.07
Feed canal	6,271.00	150,780.97
West branch (John Day project)	24,272.94	.....
Examination of project as a whole	5,930.09	.....
Administration of project as a whole	20,571.81	.....
Total	72,670.84	424,322.60
Grand total	$496,993.44	

Total expenditures according to purpose and nature on Umatilla project to June 30, 1907.

[Total, $496,993.44.]

	Services.	Traveling.	Subsistence.	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination	$6,144.83	$1,014.25	$846.16	$284.68	$12.39	$326.02	$2.74	$392.67	$98.35
Survey	23,466.89	1,213.25	5,109.09	1,874.87	45.55	2,620.16	51.19	1,595.36	.....
Design	4,145.44	100.89	78.21	.....	.....	112.34	27.24	.....	197.09
Subdivision	83.19	93.26	.....	37.52	.....	23.53	1.59	.....	.....
Building:									
Rights and property	2,002.23	780.98	73.70	206.30	5,520.00	78.35	.....	.....	.....
Building	68,690.23	1,778.52	9,160.31	83,227.49	38,639.56	15,240.72	93.50	7,929.79	185,492.93
Administration	19,514.06	2,457.22	45.84	1,980.57	24.99	3,254.50	802.52	.38	.....

PROPOSED MALHEUR PROJECT.

Final estimates prepared by a board of engineers placed the cost of this project at $42 per acre, including ten years' maintenance. This is materially higher than had been estimated before, due to additional knowledge gained by more complete surveys and extensive drilling operations at dam site. Serious obstacles were encountered through unwillingness of private landowners to pledge their lands under conditions satisfactory to the Department and through right of way and water right complications, and doubt was expressed by the settlers as to the value of the lands compared with estimated water charges.

Extensive studies were made of the possibility of reducing the area to be watered from Malheur River and utilizing Owyhee River for the irrigation of the remainder immediately south of Arcadia and additional land south of Owyhee River, thus dividing the project into a Malheur and Owyhee division.

It was found that such reduction would not materially alter the acre cost of the Malheur division, and it was hoped that as the Owyhee division promised to be more free from legal and land complications, an attractive first unit could be worked out with Owyhee River as a source of supply. The summer flow of Owyhee River having been fully appropriated, examination was made of the Owyhee watershed for practicable storage reservoirs. At Duncans Ferry a favorable site was found for the construction of a dam, which, if 100 feet high, would store 190,000 acre-feet, and if 150 feet high would store 480,000 acre-feet. A less favorable storage reservoir was located at Red Butte Valley. Diamond drill borings were made at both locations to determine position of bed rock at dam sites.

Preliminary plans and estimates were made on the basis of irrigating 63,000 acres—27,000 acres north of the Owyhee as far as Arcadia, and 36,000 acres south of the river, principally south of Sucker Creek, and consequently in the State of Idaho.

Storage of 150,000 acre-feet, with a 90-foot dam at Duncans Ferry, was deemed sufficient in connection with available river flow during a portion of the irrigation season, and was made the basis of estimates. A suitable point of diversion was located 4½ miles upstream from Mitchell Butte. The final results indicated an acre cost even higher than that of the Malheur division, for which reason work on

the entire project has been indefinitely deferred. All lands withdrawn, except for reservoir sites, have been restored to entry.

The net expenditures to June 30, 1907, are $70,987.21.

PROPOSED CENTRAL OREGON PROJECTS.

Silver Creek, Chewaucan, Ana River, Silver Lake, Odell Lake, and Crescent Lake projects in central Oregon have been described in the Third Annual Report, second edition, pages 471 to 486. No further detailed investigations have been made in this region, but stream measurement work has been continued in order to obtain information in regard to the available water supply in case it should be advisable to take up these projects in the future. The net expenditures to June 30, 1907, are $22,690.61.

OREGON-CALIFORNIA.

KLAMATH PROJECT.

GENERAL STATEMENT.

The main data relating to the Klamath project are summarized below:

(Summary of principal data relating to Klamath project.)

Counties: Klamath, Oreg.; Siskiyou and Modoc, Cal.
Latitude: 42°.
Longitude: 121°.
Railroad connections: Pokegama, Oreg., 36 miles on Klamath Lake Railroad and Brays, Cal., 50 miles, on California and North Eastern Railroad. The latter road is being constructed to Klamath Falls, Oreg.
Principal markets: San Francisco, Cal., and Portland, Oreg.
Land offices for district: Lakeview, Oreg., and Susanville and Redding, Cal.
Irrigable areas in the Upper project embrace the Lost River Valley, about 46,000 acres; and the Lower project, covering Klamath River Valley, the lower Klamath Lake marshes, and a portion of the bed of Tule Lake, about 141,000 acres.
Average elevation: 4,100 feet.
Character of soil is good, being principally rich lake bottoms and decomposed basalt.
Range of temperature: Maximum, 105°; minimum, —26°.
Average rainfall: 15 inches per annum.
Ownership of lands: Public, about 45,000 acres; private, about 142,000 acres.
Size of farm units has been tentatively fixed at 160 acres.
Values of irrigated lands: $20 to $100 per acre.
Principal products: Alfalfa, grain, fruits, and vegetables.
Duty of water: 1½ acre-feet per acre per annum.
Source of water supply: Lower project, which includes the Klamath Valley, a portion of Poe Valley, the lower Klamath marshes, and a portion of the bed of Tule Lake, is the upper Klamath Lake. The estimated watershed area of this lake is 3,100 square miles. The average rainfall over this area is not accurately known, but from the records kept at Fort Klamath, it is estimated to be about 20 inches per annum. The mean annual runoff from the watershed since 1904 is 1,802,430 acre-feet.

After preliminary investigation this project was favorably reported on by a board of engineers and its construction was authorized on May 17, 1905.

Upper Klamath Lake, with a surface area of nearly 60,000 acres and a variation of from 4 to 5 feet in elevation, serves as a natural reservoir for conserving the water and regulating the flood discharges. Water is taken from this lake by means of the main canal, on the eastern side of the valley, and the Keno Canal on the western side.

The main canal, now constructed to its first principal diversion point, has a length of 9 miles and a maximum capacity of 1,500 second-feet. Keno Canal, now under construction, has a capacity at its head of 635 second-feet. The total length of canals on the lower project, when completed, is estimated at 75 miles of main and 134 miles of laterals. The Keno Canal also provides for the development of power to the extent of about 2,000 horsepower.

Investigation of the drainage of the marshes around lower Klamath Lake has been carried on during the past year. The amount of excavation required to drain these marshes by gravity is large and the question of treating them by means of dikes and pumping has been considered.

The upper project, which includes Langell's and Yonna Valleys and a part of Poe Valley, receives its water supply from the Clear Lake watershed. The area of this watershed is approximately 600 square miles and the average annual rainfall, as estimated from available records, is 15 inches. The mean annual run-off from this watershed since 1904, is 148,900 acre-feet. The Clear Lake reservoir site has a capacity of 460,000 acre-feet and an area of 25,000 acres. For this storage a dam 30 feet high and 850 feet long will be required. Either a rock-fill or masonry dam is suitable for this site, but on account of the spillway capacity required, a masonry dam has some advantages. Designs and estimates have been made for both, but the type to be finally used has not been selected. There will also be required a low dam about 4,000 feet long to close a gap at the south end of Clear Lake.

MAIN CANAL.

Work on construction of the main canal, begun in the spring of 1906, has been carried on throughout the year by the contractors, Mason, Davis & Co. This work was not completed within the contract time and an extension of time was granted. Divisions 2 and 3 of this canal were completed on May 20, 1907, and water turned into it through the old Ankeny canal on May 22, 1907. Division 1, which includes the tunnel and main headworks, was completed to a point that water was turned in against the gates on June 27 and the division formally put in commission on that date. The work at that time was not, however, entirely completed.

This canal has a capacity of 1,500 second-feet and is designed to supply water to the main Klamath Valley. In the construction of this canal, exclusive of the tunnel, 723,528 cubic yards of material were excavated and 4,095 cubic yards of concrete put in place in the canal linings, turn-outs, culverts, and bridge piers. The tunnel is 3,300 feet long, 14 feet 4½ inches high, and 13 feet 6 inches wide, and is concrete lined throughout.

EAST BRANCH CANAL.

Work on the East Branch canal was begun by force account, in September, 1906. This canal has a capacity of 261 second-feet, is 16 feet wide on the bottom and 8 feet deep, with 1½ to 1 side slopes, and is designed to carry water 6 feet deep. This canal, which will supply water to Poe Valley and to the area east of Lost River and north of Tule Lake, is now completed to Olene, excepting the putting in of concrete turn-outs. On this work there were moved 92,277 cubic yards of class 1, 8,853 cubic yards of class 2, and 150 cubic yards of class 3 material.

LATERAL SYSTEM.

The lateral system under the Main canal and East Branch canal to Olene, has been constructed by force account. The total irrigable

area under this unit is 11,600 acres. The total length of laterals and drains constructed is 33.4 miles and the total excavation 164,271 cubic yards, all of class 1 material. The capacity of the laterals varies from 8 to 80 second-feet. On account of high cost of freighting cement into the country by teams, most lateral structures have been built of wood.

KENO CANAL.

Bids for the construction of schedules 1, 2, 3, and 4 of the Keno canal were opened April 15, 1907. One bid was received, that of Paquet, Giebisch & Joplin, which was as follows:

Bid of Paquet, Giebisch & Joplin, being the only bid received on schedules 1, 2, 3, and 4, excavation, stations 6 to 64, Keno canal, Klamath project.

[Specifications No. 132.]

Total amount of bid $62,829.50. All schedules to be accepted or none.
Excavation, class 1, 47,150 cubic yards, at 75 cents per cubic yard.
Excavation, class 2, 16,620 cubic yards, at 85 cents per cubic yard.
Excavation, class 3, 13,340 cubic yards, at $1 per cubic yard.

The prices bid for classes 1 and 2 were considered excessive and upon recommendation of a board of engineers authority was given to do the work by force account. The capacity of this canal is 635 second-feet, 205 second-feet of which is to be delivered to Moore Brothers for power purposes. This is in accordance with a contract entered into between the United States and Moore Brothers, whereby the latter surrender all riparian and other rights to the waters of Link River, and in lieu thereof receive water as above stated.

All structures on this canal including headworks, diverting weir and turn-outs, are of concrete. Under the terms of the contract with Moore Brothers this canal must be completed ready for the delivery of water by December 1, 1907.

SAND-CRUSHING PLANT.

On account of scarcity of sand suitable for concrete work a sand-crushing plant, consisting of 30-horsepower steam engine, rock-crusher, roll, and the necessary screens, was purchased and installed near the head of Link River. The cost of the plant in place was $4,138.10. The rock used for crushing was hard basalt, which breaks up sharp and makes a very satisfactory product for concrete work. The capacity of the plant is 2 cubic yards per hour. One thousand five hundred and seventy-five cubic yards of sand have been produced at a cost of approximately $2.50 per cubic yard.

HEADQUARTERS SITE.

During the fall of 1906 one-half acre of land was purchased in the town of Klamath Falls for permanent headquarters. On this tract a storehouse, a barn, and an office building 30 by 40 feet have been erected, the latter not quite completed. It contains the necessary office rooms for engineers, accountants, and operation and maintenance employees, and is equipped with a fireproof vault.

TELEPHONE LINE.

A telephone line has been built from Klamath Falls to Olene, along the line of the Main and East Branch canals and also along one of the principal laterals, a total length of 13 miles. The cost of con-

struction, exclusive of cost of material, but including delivery of all material on the line, was $84.60 per mile.

OPERATION AND MAINTENANCE.

For the irrigation season of 1907 canals, laterals, and structures for covering about 20,500 acres were ready for use on the project. The area ready for operation lies in two districts. One of these is in the vicinity of Tule Lake, with the town of Merrill, Oreg., near the center. In this district about 6,500 acres are under ditches. The district is covered by the old Adams canal system and receives its supply of water temporarily from the lower Klamath Lake. The other irrigation district lies contiguous to the town of Klamath Falls and under the first section of the main canal, as constructed between upper Klamath Lake and Olene, Oreg. Under this district are about 14,000 acres of land on which construction is completed. The water supply for this district is taken from the upper Klamath Lake.

Irrigation for the season began for the Merrill district on May 16, 1907, and has continued without interruption throughout the season.

The main canal was opened for the Klamath district on May 22, 1907, through the old Ankeny canal, the headworks of the main canal not being completed at that time.

Of the estimated 20,500 acres under ditches, about 3,500 acres were irrigated in the Merrill district and about 6,000 acres in the Klamath district, a total of 9,500 acres, leaving 3,000 acres under ditch in the Merrill district and 8,000 acres in the Klamath district not irrigated.

The length of ditches operated is approximately as follows:

Ditches in operation.

	Miles.
Main canals	23.5
Main laterals	21.5
Secondary laterals	25.5
Total	70.5

Records are kept of the delivery of water to each farm unit being irrigated, but so far a complete system of weirs has not been installed. Gauges are being used generally. The number of acres cropped in each unit must be determined in order to systematize the operation in future.

Subdivision of the larger farms into 160-acre units is progressing slowly. During the season 1,100 acres of new land have been watered. The entire acreage now under ditch is in private ownership.

FORCE ACCOUNT WORK.

Work was carried on by force account on the lateral system during the latter part of 1906, and on the East Branch canal during 1906 and 1907. This work was done both with Government and hired private stock. Difficulty was experienced in getting sufficient men to carry on the work to its full capacity, and the cost was thereby increased. During 1906 the rate of wages paid laborers for an eight-hour day was $2.88, and hired teams were paid for at the rate of $2.16 per day for two horses. During 1907 laborers' wages have varied from $2.24 to $2.48 per day, and the rate paid for teams was $2 per day.

In the spring of 1907 proposals were asked for the excavation of a part of the East Branch canal and of the Poe Valley canals. Only one bid was received for this work, that of N. C. Gunn, a local contractor, at the following prices:

	Per cubic yard.
Class 1, excavation	$0.75
Class 2, excavation	.80
Class 3, excavation	.90

The cost of excavation of classes 1 and 2 under these prices was considered excessive, and the bid was rejected.

Excavation done by force account during the fiscal year 1906–7 cost as follows:

Excavation, East Branch Canal.

Class.	Quantities.	Cost per cubic yard exclusive of engineering and executive.	Cost per cubic yard including engineering and executive.
	Cubic yards.		
1	92,277	$0.221	$0.240
2	8,853	.430	.467
3	150	1.229	1.334

Class 1, excavation on laterals, first unit main canal, amounted to 164,271 cubic yards, and the cost per cubic yard, exclusive of engineering and executive expenses, was $0.194. Including engineering and executive expenses, the cost per cubic yard was $0.22.

EXPENDITURES.

The expenditures on the Klamath project are summarized in the following tables:

Expenditures, according to physical features, on Klamath project to June 30, 1907.

Feature.	Engineering and administration.	Building.
Incidental structures:		
Bridges, main canal		$1,552.53
Bridges and culverts, east branch		1,576.39
Bridges and culverts, distributing system		1,962.97
Office building and warehouse		1,350.17
Rock crusher		4,138.10
Telephone line		770.07
Irrigation structures:		
Main canal and tunnel		360,179.14
East branch canal		32,615.68
Keno canal	$3,589.15	
Distributing system, excavation		60,227.74
Lands, property, and rights of way		461,102.67
Poe Valley canals and distributing system	1,966.85	
Operation and maintenance	2,872.06	
Soil examination	1,418.00	
Materials and stores		12,957.70
Administration of project as a whole	55,592.46	
Examination of project as a whole	57,901.39	
Total	123,339.91	938,433.16
Grand total	1,061,773.07	

Total expenditures, according to purpose and nature, on Klamath project to June 30, 1907.

[Total, $1,061,773.07.]

	Services.	Traveling.	Subsistence.	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination	$12,991.51	$2,875.37	$3,265.00	$3,280.39	$2.00	$2,438.98	$283.47	$265.77	$537.77
Survey	24,353.03	3,214.48	6,117.00	6,223.42	.....	2,581.70	293.37	1,994.43	.....
Design	5,585.56	449.43	206.03	123.23	.....	53.70	96.88	.....	112.23
Subdivision	731.34	177.27	35.55	87.86	.....	61.76	7.86	35.60	.....
Building:									
Rights and property	7,178.82	667.75	127.40	4.40	473,983.50	1,697.81	112.00	25.51	.....
Building	67,329.39	900.02	10,353.55	24,791.33	24,125.90	10,518.46	429.09	10,493.33	299,936.73
Operation	206.80	.....	.....	.....	.....	13.25	.....	.....	.....
Administration	37,636.19	3,309.96	1,161.19	1,908.35	2.12	3,502.59	2,517.76	985.37	.....

SOUTH DAKOTA.

BELLE FOURCHE PROJECT.

GENERAL STATEMENT.

The principal facts relating to the Belle Fourche project are summarized below:

Summary of principal data relating to Belle Fourche project.

Counties: Butte, Meade. Townships 6 to 10 north, ranges 3 to 8 east, Black Hills meridian.
Latitude: 44° 40′.
Longitude: 103° 30′.
Altitude: 2,600 to 3,000 feet.
Railroads: Chicago and Northwestern; Chicago, Burlington and Quincy, 14 miles southwest; Chicago, Milwaukee and St. Paul, 50 miles southeast.
Principal markets: Omaha, Sioux City, Chicago, Minneapolis, St. Paul, and mining towns in Black Hills.
Land office: Rapid City, S. Dak.
Irrigable area: Located in townships 7 to 10 north, ranges 2 to 7 east, Black Hills meridian. Extent east and west about 40 miles, north and south about 13 miles.
Average elevation: 2,800 feet.
Character of soil: North side, clayey loam; south side, sandy loam.
Range of temperature: Maximum, 100°; minimum, —30°.
Average rainfall: 14 to 18 inches.
Total area of irrigable land: 100,000 acres; public, 50,000 acres; private, 45,000 acres; State, 5,000 acres.
Size of farm units: 80 acres irrigable land.
Value of irrigable land: $75 to $100 per acre.
Principal products: Alfalfa, grain, vegetables, hardy fruits, sugar beets, native hay.
Duty of water: 2 acre-feet per acre per annum.
Watershed: 4,300 square miles.
Average rainfall: 18 to 25 inches in mountains.
Average annual discharge of Belle Fourche River at head of inlet canal, 400,000 acre-feet.
Storage reservoir: Area, 8,010 acres; capacity, 203,770 acre-feet.
Storage dam: Earth dam with concrete revetment; length on top, 6,200 feet; maximum height, 115 feet.
Diversion dam: Gravity section concrete; length, 400 feet; height, 23 feet.
Main canals: Length, 100 miles; width on bottom, 14 to 40 feet.
Lateral canals: Length, 125 miles.
Sublateral canals: Aggregate length: 1,000 miles.

A reconnaissance survey of the Belle Fourche Valley was begun on July 18, 1903, with the view of the irrigation of part of it with the waters of Belle Fourche and Redwater rivers, which were going to waste each year and were badly needed to mature crops in the valley. On April 29, 1904, a board met at Belle Fourche and examined the lands, water supply, and possibilities of reclamation as shown by the surveys. On May 10, 1904, the construction of the

project was authorized by the Secretary of the Interior. On July 20, 1904, the Belle Fourche Valley Water Users' Association was organized by the residents of the valley who owned private lands under the proposed system, the total area under the same being represented by 100,000 shares of stock of a total value of $3,400,000.

Final surveys and plans were made during the summer of 1904, and on April 10, 1905, bids were opened at Denver, Colo., for the diversion dam, main feeder canal, and structures on main feeder canal. Contracts were awarded on April 24 and 26, and construction work was started immediately and has been carried on continuously to this date.

As planned and being constructed, the project contemplates the reclamation of 100,000 acres, in the Belle Fourche Valley, beginning about 2 miles east of the town of Belle Fourche and extending east for 40 miles. The valley lands on both sides of the river are included in the irrigable area.

The main supply canal and diversion dam have been completed and water turned in. The waters of Belle Fourche River run through this canal and are to be stored in the Belle Fourche reservoir, which will hold sufficient water to irrigate completely all lands in the project except about 4,000 acres which are above the reservoir and will receive water from the river.

Two canals carry the water from the reservoir to the lands. One, the north canal, runs in a northerly and easterly direction and serves land in Indian, Horse, Dry, and Willow Creek valleys. The other, the south canal, runs in a southerly and then easterly direction and irrigates lands in the Owl Creek Valley and the land on the south side of the river in the vicinity of Vale and Empire, S. Dak.

The first section of the south canal has been completed and water will be furnished to about 8,000 acres of land under it and to 4,000 acres under the Inlet canal on April 1, 1908. The area that will receive water will be increased each year as the different canals are completed until the final completion in 1910.

MAIN SUPPLY CANAL.

The inlet, or main canal, is 6½ miles long and runs from Belle Fourche River to the reservoir. It will be used chiefly to fill the reservoir, there being but about 4,000 acres of irrigable land under it. The canal is 40 feet wide on the bottom and 70 feet wide at high-water line, and carries 10 feet depth of water. The grade is 1 foot per mile and capacity 1,635 second-feet. There are two cuts on the same of over 40 feet. The water enters the canal through a concrete regulator. At Crow Creek, a half mile below the regulator, a wasteway and set of three sluice gates are located. This structure is built of concrete and has an overflow of 200 feet. There are three openings in the same, controlled by cast-iron gates, operated with ball-bearing pedestals.

At the end of the canal a concrete weir or overflow 180 feet long, with a concrete apron, has been constructed to drop water from canal to reservoir. Water will flow over the weir only 2 feet deep when the canal is running full. The structure is so arranged that the canal can be emptied through an opening at the lower end.

DIVERSION DAM AND REGULATOR.

The dam in Belle Fourche River is used to raise the water in the river about 8 feet into the canal and divert the flow to a depth of 10 feet down the canal. The dam consists of a concrete weir or overflow 400 feet long, founded on bed rock and connected on the south side with an earth wing dam 1,300 feet long, which is paved on water slope, or upper side, with 18 inches of stone.

The regulator at the head of the supply canal consists of seven openings, each 5 feet wide, the water being controlled by double gates, operated by ball-bearing pedestals. There are also three gates of the same size through the dam, used as sluice gates, or to waste the water down the river if desired without forcing it over the weir. The above works are completed and ready for use.

BELLE FOURCHE DAM.

The Belle Fourche dam, which is being built across Owl Creek, 12 miles northeast of the town of Belle Fourche, will, when completed, be one of the highest earthen dams in the United States. The water will be backed up Owl Creek about 10 miles and a water area of 8,010 acres produced, having an available storage of 203,770 acre-feet. The dam is built of earth, watered and rolled in 6-inch layers. The water slope will be protected with 2 feet of gravel, on which a facing of 8 inches of concrete will be placed. The outer slope will be seeded to grass to protect it from wash.

There are two conduits through the dam. One is at the head of the north canal, and one is at the head of the south canal. These are reenforced concrete structures and the water is controlled by cast-iron gates. The dam, when completed, will be 115 feet high at the highest point and 6,200 feet long on top. An overflow wasteway capable of discharging 3,000 cubic feet per second is to be provided.

NORTH CANAL.

This canal will be 45 miles long. The first section has been completed and is ready for use. The main structures on it will be the Indian Creek pressure pipes and the Horse Creek pressure pipes. These will both be constructed of reenforced concrete. The first section of the canal is 32 feet wide on the bottom, carries 7 feet of water, and has a capacity of 650 cubic feet per second.

SOUTH CANAL.

This canal will be 45 miles long, and the first section has been completed and is ready for use. It is 18 feet wide on the bottom, carries water to a depth of 5½ feet, and has a capacity of 320 second-feet. The main structures needed are two wasteways, the Belle Fourche, Anderson, and the Whitewood pressure pipes, and a tunnel 1,295 feet long. The total length of the siphons needed is 4,600 feet. Work is in progress.

The following is schedule of bids opened on April 10 for the construction of south canal and structures:

Bids opened April 10, 1907, for construction of south canal and structures, Belle Fourche project, South Dakota.

[Specifications No. 134.]

BIDDERS.

A. The S. R. H. Robinson & Son Contracting Company, St. Louis, Mo.: Schedule 1, section 2, $103,895; section 3, $240,087.50; section 4, $44,840; section 5, $32,720; section 6, $30,415; section 7, $30,515; section 8, $37,540; schedule 2, $51,865.
B. W. D. Lovell, Minneapolis, Minn.: Schedule 1, section 5, $40,800; section 6, $36,050; section 7, $35,150; section 8, $46,100.
C. J. E. Hilton, Belle Fourche, S. Dak.: Schedule 1, section 6, $18,300; section 7, $19,200; section 8, $26,800.

SCHEDULE 1, SECTION 2, BIDDER A.[a]

Canal excavation:
Class A, 70,000 cubic yards, 30 cents per cubic yard.
Class B, 2,000 cubic yards, 30 cents per cubic yard.
Class C, 300 cubic yards, 30 cents per cubic yard.
Overhaul, 10,000 cubic yards, 2 cents per cubic yard per 100 feet.
Excavation for siphon and appurtenances and one culvert:
Dry, class A, 7,200 cubic yards, $1.85 per cubic yard.
Dry, class B, 500 cubic yards, $1.85 per cubic yard.
Dry, class C, 100 cubic yards, $1.85 per cubic yard.
Wet, class A, 300 cubic yards, $4 per cubic yard.
Wet, class B, 2,000 cubic yards, $4 per cubic yard.
Wet, class C, 100 cubic yards, $4 per cubic yard.
Belle Fourche River crossing, $5,000.
Stripping gravel pit, 5,000 cubic yards, 28 cents per cubic yard.
Screened gravel, 20 cubic yards, $5 per cubic yard.
Placing steel and iron work, 285,00 pounds, 1½ cents per pound.
Hauling, storing, and caring for cement, 3,500 barrels, $1.50 per barrel.
Concrete, 2,500 cubic yards: $16.50 per cubic yard.
Lumber in platforms and drains, 10,000 feet B. M.: $70 per M feet B. M.

SCHEDULE 1, SECTION 3, BIDDER A.[a]

Canal excavation:
Class A, 200,000 cubic yards: 39 cents per cubic yard.
Class B, 25,000 cubic yards: 39 cents per cubic yard.
Class C, 1,500 cubic yards: 39 cents per cubic yard.
Overhaul, 100,000 cubic yards: 2 cents per cubic yard per 100 feet.
Excavation for siphon and appurtenances:
Dry, class A, 3,000 cubic yards: $2 per cubic yard.
Dry, class B, 300 cubic yards: $2 per cubic yard.
Dry, class C, 100 cubic yards: $2 per cubic yard.
Wet, class A, 650 cubic yards: $4 per cubic yard.
Wet, class B, 300 cubic yards: $4 per cubic yard.
Wet, class C, 100 cubic yards: $4 per cubic yard.
Excavation for structures:
Class A, 500 cubic yards: $1.50 per cubic yard.
Class B, 300 cubic yards: $1.50 per cubic yard.
Whitewood Creek crossing: $3,000.
Stripping gravel pits, 5,000 cubic yards: 28 cents per cubic yard.
Screened gravel, 30 cubic yards: $5 per cubic yard.
Placing steel and iron work, 65,000 pounds: 1½ cents per pound.
Hauling, storing, and caring for cement, 3,800 barrels: $1.50 per barrel.
Lumber in platforms and drains, 10,000 feet B. M.: $70 per M feet B. M.

[a] Only bidder.

Concrete, siphon and appurtenances:
Class A, 1,000 cubic yards: $19.50 per cubic yard.
Class B, 200 cubic yards: $22 per cubic yard.
Class C, 120 cubic yards: $22 per cubic yard.
Class D, 1,700 cubic yards: $22 per cubic yard.
Excavation for tunnel, 6,000 cubic yards: $8 per cubic yard.
Additional trimming, 200 cubic yards: $5 per cubic yard.
Timbering in tunnel, 100,000 feet B. M.: $75 per M feet B. M.
Tunnel drainage, 400 linear feet: 50 cents per linear foot.
Dry packing in tunnel:
Type A, 595 linear feet: $2.50 per linear foot.
Type B, 700 linear feet: $5 per linear foot.

SCHEDULE 1, SECTION 4, BIDDER A.[a]

Canal excavation:
Class A, 120,000 cubic yards: 32 cents per cubic yard.
Class B, 15,000 cubic yards: 32 cents per cubic yard.
Class C, 2,000 cubic yards: 32 cents per cubic yard.
Overhaul, 50,000 cubic yards; at 2 cents per cubic yard per 100 feet.

SCHEDULE 1, SECTION 5.

Canal excavation:
Class A, 90,000 cubic yards: Bidder A, 32 cents; Bidder B, 31 cents per cubic yard.
Class B, 10,000 cubic yards: Bidder A, 32 cents; Bidder B, 80 cents per cubic yard.
Class C, 1,000 cubic yards: Bidder A, 32 cents; Bidder B, $4.50 per cubic yard.
Overhaul, 20,000 cubic yards: Bidder A, 2 cents; Bidder B, 2 cents per cubic yard per 100 feet.

SCHEDULE 1, SECTION 6.

Canal excavation:
Class A, 100,000 cubic yards: Bidder A, 29 cents; Bidder B, 31 cents; Bidder C, 16½ cents per cubic yard.
Class B, 3,000 cubic yards: Bidder A, 29 cents; Bidder B, 80 cents: Bidder C, 30 cents per cubic yard.
Class C, 500 cubic yards: Bidder A, 29 cents; Bidder B, $4.50; Bidder C, $1 per cubic yard.
Overhaul, 20,000 cubic yards: Bidder A, 2 cents; Bidder B, 2 cents; Bidder C, 2 cents per cubic yard per 100 feet.

SCHEDULE 1, SECTION 7.

Canal excavation:
Class A, 100,000 cubic yards: Bidder A, 29 cents; Bidder B, 30 cents; Bidder C, 17 cents per cubic yard.
Class B, 3,000 cubic yards: Bidder A, 29 cents; Bidder B, 80 cents; Bidder C, 40 cents per cubic yard.
Class C, 500 cubic yards: Bidder A, 29 cents; Bidder B, $4.50; Bidder C, $1 per cubic yard.
Overhaul, 25,000 cubic yards: Bidder A, 2 cents; Bidder B, 2 cents; Bidder C, 2 cents per cubic yard per 100 feet.

SCHEDULE 1, SECTION 8.

Canal excavation:
Class A, 120,000 cubic yards: Bidder A, 29 cents; Bidder B, 30½ cents; Bidder C, 19 cents per cubic yard.
Class B, 5,000 cubic yards: Bidder A, 29 cents; Bidder B, 80 cents; Bidder C, 40 cents per cubic yard.
Class C, 1,000 cubic yards: Bidder A, 29 cents; Bidder B, $4.50; Bidder C, $1 per cubic yard.
Overhaul, 50,000 cubic yards: Bidder A, 2 cents; Bidder B, 2 cents; Bidder C, 2 cents per cubic yard.

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[a] Only bidder.

SCHEDULE 2, BIDDER A.[a]

Excavation for structures:
Class A, 4,000 cubic yards: $1 per cubic yard.
Class B, 300 cubic yards: $1 per cubic yard.
Class C, 100 cubic yards: $1 per cubic yard.
Miscellaneous grading, 1,000 cubic yards: $1 per cubic yard.
Stripping gravel pits, 5,000 cubic yards: 28 cents per cubic yard.
Screened gravel, 100 cubic yards: $5 per cubic yard.
Back filling, 500 cubic yards: $2 per cubic yard.
Concrete, 1,600 cubic yards: $22 per cubic yard.
Placing steel and iron work, 5,000 pounds: 1¼ cents per pound.
Hauling, storing, and caring for cement, 2,000 barrels: $2 per barrel.
Laying 24-inch vitrified pipe, 100 feet: $2 per foot.
Wooden stringer bridges, superstructures only:
40-foot span, 6, at $390 each.
36-foot span, 5, at $350 each.

Contract for sections 7 and 8 of schedule 1 was awarded to J. E. Hilton, but all other bids were rejected. The remaining work was at once readvertised and the following bids received:

Bids opened June 10, 1907, for canals and structures, Belle Fourche project, South Dakota.

[Specifications No. 134.]

BIDDERS.

A. The S. R. H. Robinson & Son Contracting Company, St. Louis, Mo.; schedule 1, section 2, $99,312; section 3, $223,502.50; section 4, $44,000; section 5, $31,900; section 6, $27,850; schedule 2, $45,625.

B. Hugh Naun Contracting Company, Roxbury, Mass.; schedule 1, section 2, $90,885; section 3, $228,860; section 4, $46,740; section 5, $33,520; section 6, $31,670; schedule 2, $41,800.

C. Deadwood Construction Company, Deadwood, S. Dak.; schedule 1, section 2, $103,675; section 3, $226,565; section 4, $47,000; section 5, $36,100; section 6, $27,800, schedule 2, $44,275.

D. Devore Bros. & Farlow, Vale, S. Dak.; schedule 1, section 4, $45,900; section 5, $30,700; section 6, $26,900.

SCHEDULE 1, SECTION 2.

Canal excavation, class A, 70,000 cu. yds.:
Bidder A, 29 cents per cu. yd.
Bidder B, 30 cents per cu. yd.
Bidder C, 26 cents per cu. yd.

Canal excavation, class B, 2,000 cu. yds.:
Bidder A, 29 cents per cu. yd.
Bidder B, 75 cents per cu. yd.
Bidder C, 80 cents per cu. yd.

SCHEDULE 1, SECTION 2—Cont'd.

Canal excavation, class C, 300 cu. yds.:
Bidder A, 29 cents per cu. yd.
Bidder B, $1 per cu. yd.
Bidder C, $1.50 per cu. yd.
Overhaul, 10,000 cu. yds.:
Bidder A, 2 cents per cu. yd.
Bidder B, 2 cents per cu. yd.
Bidder C, 2 cents per cu. yd.
Excavation, siphon: Dry, class A, 7,200 cu. yds.:
Bidder A, $2.10 per cu. yd.
Bidder B, $1.25 per cu. yd.
Bidder C, $1.50 per cu. yd.
Excavation, siphon: Dry, class B, 500 cu. yds.:
Bidder A, $2.10 per cu. yd.
Bidder B, $1.50 per cu. yd.
Bidder C, $2.50 per cu. yd.
Excavation, siphon: Dry, class C, 100 cu. yds.:
Bidder A, $2.10 per cu. yd.
Bidder B, $1.50 per cu. yd.
Bidder C, $3 per cu. yd.
Excavation, siphon: Wet, class A, 300 cu. yds.:
Bidder A, $2.10 per cu. yd.
Bidder B, $3 per cu. yd.
Bidder C, $4 per cu. yd.
Excavation, siphon: Wet, class B, 2,000 cu. yds.:
Bidder A, $2.10 per cu. yd.
Bidder B, $3 per cu. yd.
Bidder C, $5 per cu. yd.
Excavation, siphon: Wet, class C, 100 cu. yds.:
Bidder A, $2.10 per cu. yd.
Bidder B, $3 per cu. yd.
Bidder C, $5 per cu. yd.

[a] Only bidder.

SCHEDULE 1, SECTION 2—Cont'd.

Belle Fourche cofferdam:
Bidder A, $5,000.
Bidder B, $5,000.
Bidder C, $5,000.
Stripping gravel pit, 5,000 cu. yds.:
Bidder A, 28 cents per cu. yd.
Bidder B, 28 cents per cu. yd.
Bidder C, 25 cents per cu. yd.
Screened gravel, 20 cu. yds.:
Bidder A, $5 per cu. yd.
Bidder B, $3 per cu. yd.
Bidder C, $5 per cu. yd.
Placing steel, 285,000 pounds:
Bidder A, 1½ cents per pound.
Bidder B, 1½ cents per pound.
Bidder C, 1½ cents per pound.
Hauling and storing cement, 3,500 barrels:
Bidder A, $1.50 per barrel.
Bidder B, $1.60 per barrel.
Bidder C, $1.50 per barrel.
Concrete, 2,500 cu. yds.:
Bidder A, $16 per cu. yd.
Bidder B, $13.50 per cu. yd.
Bidder C, $17 per cu. yd.
Lumber in platforms, 10,000 feet:
Bidder A, $70 per M feet.
Bidder B, $70 per M feet.
Bidder C, $80 per M feet.

SCHEDULE 1, SECTION 3.

Canal excavation, class A, 200,000 cu. yds.:
Bidder A, 38 cents per cu. yd.
Bidder B, 37 cents per cu. yd.
Bidder C, 30 cents per cu. yd.
Canal excavation, class B, 25,000 cu. yds.:
Bidder A, 38 cents per cu. yd.
Bidder B, 80 cents per cu. yd.
Bidder C, 85 cents per cu. yd.
Canal excavation, class C, 1,500 cu. yds.:
Bidder A, 38 cents per cu. yd.
Bidder B, $1 per cu. yd.
Bidder C, $1.50 per cu. yd.
Overhaul, 100,000 cu. yds:
Bidder A, 2 cents per cu. yd.
Bidder B, 2 cents per cu. yd.
Bidder C, 2 cents per cu. yd.
Excavation, siphon: Dry, class A, 3,000 cu. yds.:
Bidder A, $2 per cu. yd.
Bidder B, $1.25 per cu. yd.
Bidder C, $1.50 per cu. yd.
Excavation, siphon: Dry, class B, 300 cu. yds.:
Bidder A, $2 per cu. yd.
Bidder B, $1.25 per cu. yd.
Bidder C, $2.50 per cu. yd.
Excavation, siphon: Dry, class C, 100 cu. yds.:
Bidder A, $2 per cu. yd.
Bidder B, $1.50 per cu. yd.
Bidder C, $3 per cu. yd.

SCHEDULE 1, SECTION 3—Cont'd.

Excavation, siphon: Wet, class A, 650 cu. yds.:
Bidder A, $2 per cu. yd.
Bidder B, $3 per cu. yd.
Bidder C, $5 per cu. yd.
Excavation, siphon: Wet, class B, 300 cu. yds.:
Bidder A, $2 per cu. yd.
Bidder B, $3 per cu. yd.
Bidder C, $5 per cu. yd.
Excavation, siphon: Wet, class C, 100 cu. yds.:
Bidder A, $2 per cu. yd.
Bidder B, $3 per cu. yd.
Bidder C, $5 per cu. yd.
Excavation, structures: Class A, 500 cu. yds.:
Bidder A, $2 per cu. yd.
Bidder B, $1.30 per cu. yd.
Bidder C, $1.50 per cu. yd.
Excavation, structures: Class B, 300 cu. yds.:
Bidder A, $2 per cu. yd.
Bidder B, $1.30 per cu. yd.
Bidder C, $2.50 per cu. yd.
Whitewood cofferdam:
Bidder A, $3,000.
Bidder B, $3,000.
Bidder C, $3,000.
Stripping gravel pits, 5,000 cu. yds.:
Bidder A, 28 cents per cu. yd.
Bidder B, 28 cents per cu. yd.
Bidder C, 25 cents per cu. yd.
Screened gravel, 30 cu. yds.:
Bidder A, $5 per cu. yd.
Bidder B, $3 per cu. yd.
Bidder C, $5 per cu. yd.
Placing steel, 65,000 pounds:
Bidder A, 1½ cents per pound.
Bidder B, 1½ cents per pound.
Bidder C, 1½ cents per pound.
Hauling and storing cement, 3,800 barrels:
Bidder A, $1.50 per barrel.
Bidder B, $1.60 per barrel.
Bidder C, $1.50 per barrel.
Lumber in platforms, 10,000 feet:
Bidder A, $70 per M feet.
Bidder B, $70 per M feet.
Bidder C, $80 per M feet.
Concrete: Class A, 1,000 cu. yds.:
Bidder A, $16 per cu. yd.
Bidder B, $16.50 per cu. yd.
Bidder C, $18 per cu. yd.
Concrete: Class B, 200 cu. yds.:
Bidder A, $14 per cu. yd.
Bidder B, $18 per cu. yd.
Bidder C, $18 per cu. yd.
Concrete: Class C, 120 cu. yds.:
Bidder A, $16 per cu. yd.
Bidder B, $18 per cu. yd.
Bidder C, $18 per cu. yd.
Concrete: Class D, 1,700 cu. yds.:
Bidder A, $18 per cu. yd.
Bidder B, $20 per cu. yd.
Bidder C, $22 per cu. yd.

SCHEDULE 1, SECTION 3—Cont'd.

Excavation for tunnel, 6,000 cu. yds.:
Bidder A, $8 per cu. yd.
Bidder B, $7 per cu. yd.
Bidder C, $7 per cu. yd.
Additional trimming, 200 sq. yds.:
Bidder A, $5 per sq. yd.
Bidder B, $3.50 per sq. yd.
Bidder C, $4 per sq. yd.
Timber in tunnel, 100,000 feet:
Bidder A, $75 per M ft.
Bidder B, $75 per M ft.
Bidder C, $80 per M ft.
Tunnel drain, 400 feet:
Bidder A, 50 cents per foot.
Bidder B, 50 cents per foot.
Bidder C, 60 cents per foot.
Dry packing, type A, 595 feet:
Bidder A, $2.50 per foot.
Bidder B, $2 per foot.
Bidder C, $2 per foot.
Dry packing, type B, 700 feet:
Bidder A, $5 per foot.
Bidder B, $4 per foot.
Bidder C, $5 per foot.

SCHEDULE 1, SECTION 4.

Canal excavation, class A, 120,000 cu. yds.:
Bidder A, 30 cents per cu. yd.
Bidder B, 29 cents per cu. yd.
Bidder C, 25 cents per cu. yd.
Bidder D, 29½ cents per cu. yd.
Canal excavation, class B, 15,000 cu. yds.:
Bidder A, 40 cents per cu. yd.
Bidder B, 62 cents per cu. yd.
Bidder C, 80 cents per cu. yd.
Bidder D, 50 cents per cu. yd.
Canal excavation, class C, 2,000 cu. yds.:
Bidder A, 50 cents per cu. yd.
Bidder B, 82 cents per cu. yd.
Bidder C, $2 per cu. yd.
Bidder D, $1 per cu. yd.
Overhaul, 50,000 cu. yds.:
Bidder A, 2 cents per cu. yd.
Bidder B, 2 cents per cu. yd.
Bidder C, 2 cents per cu. yd.
Bidder D, 2 cents per cu. yd.

SCHEDULE 1, SECTION 5.

Canal excavation, class A, 90,000 cu-yds.:
Bidder A, 30 cents per cu. yd.
Bidder B, 29 cents per cu. yd.
Bidder C, 28 cents per cu. yd.
Bidder D, 27 cents per cu. yd.
Canal excavation, class B, 10,000 cu. yds.:
Bidder A, 40 cents per cu. yd.
Bidder B, 62 cents per cu. yd.
Bidder C, 85 cents per cu. yd.
Bidder D, 50 cents per cu. yd.

SCHEDULE 1, SECTION 5—Cont'd.

Canal excavation, class C, 1,000 cu. yds.:
Bidder A, 50 cents per cu. yd.
Bidder B, 82 cents per cu. yd.
Bidder C, $2 per cu. yd.
Bidder D, $1 per cu. yd.
Overhaul, 2,000 cubic yards:
Bidder A, 2 cents per cu. yd.
Bidder B, 2 cents per cu. yd.
Bidder C, 2 cents per cu. yd.
Bidder D, 2 cents per cu. yd.

SCHEDULE 1, SECTION 6.

Canal excavation, class A, 100,000 cu. yds.:
Bidder A, 26 cents per cu. yd.
Bidder B, 29 cents per cu. yd.
Bidder C, 24 cents per cu. yd.
Bidder D, 24½ cents per cu. yd.
Canal excavation, class B, 3,000 cu. yds.:
Bidder A, 40 cents per cu. yd.
Bidder B, 62 cents per cu. yd.
Bidder C, 80 cents per cu. yd.
Bidder D, 50 cents per cu. yd.
Canal excavation, class C, 500 cu. yds.:
Bidder A, 50 cents per cu. yd.
Bidder B, 82 cents per cu. yd.
Bidder C, $2 per cu. yd.
Bidder D, $1 per cu. yd.
Overhaul, 20,000 cu. yds.:
Bidder A, 2 cents per cu. yd.
Bidder B, 2 cents per cu. yd.
Bidder C, 2 cents per cu. yd.
Bidder D, 2 cents per cu. yd.

SCHEDULE 2.

Excavation, structures, class A, 4,000 cu. yds.:
Bidder A, $1 per cu. yd.
Bidder B, $1 per cu. yd.
Bidder D, $1 per cu. yd.
Excavation, structures, class B, 300 cu. yds.:
Bidder A, $1 per cu. yd.
Bidder B, $1 per cu. yd.
Bidder D, $1.50 per cu. yd.
Excavation, structures, class C, 100 cu. yds.:
Bidder A, $1 per cu. yd.:
Bidder B, $1 per cu. yd.
Bidder D, $2.50 per cu. yd.
Grading, miscellaneous, class A, 1,000 cu. yds.:
Bidder A, $1 per cu. yd.
Bidder B, $1 per cu. yd.
Bidder D, $1 per cu. yd.
Stripping gravel pits, 5,000 cu. yds.:
Bidder A, 28 cents per cu. yd.
Bidder B, 28 cents per cu. yd.
Bidder D, 25 cents per cu. yd.

SCHEDULE 2—Continued.

Screened gravel, 100 cu. yds.:
Bidder A, $5 per cu. yd.
Bidder B, $3 per cu. yd.
Bidder D, $5 per cu. yd.
Back filling, 500 cu. yds.:
Bidder A, $2 per cu. yd.
Bidder B, $1 per cu. yd.
Bidder D, $1.50 per cu. yd.
Concrete, 1,600 cu. yds.:
Bidder A, $18 per cu. yd.
Bidder B, $16 per cu. yd.
Bidder D, $18 per cu. yd.
Placing steel, 5,000 pounds:
Bidder A, 1½ cents per pound.
Bidder B, 1½ cents per pound.
Bidder D, 1½ cents per pound.

SCHEDULE 2—Continued.

Hauling and storing cement, 2,000 barrels:
Bidder A, $1.50 per barrel.
Bidder B, $1.75 per barrel.
Bidder D, $1.50 per barrel.
Laying 24-inch pipe, 100 feet:
Bidder A, $2 per foot.
Bidder B, $2 per foot.
Bidder D, $1.50 per foot.
Wooden bridges, 40-foot, 6:
Bidder A, $500 each.
Bidder B, $450 each.
Bidder D, $375 each.
Wooden bridges, 36-foot, 5:
Bidder A, $450 each.
Bidder B, $425 each.
Bidder D, $360 each.

All of these bids were rejected.

On May 28, 1907, bids for furnishing steel were opened at Belle Fourche, and the following bid was received from the General Fireproofing Company, of Youngstown, Ohio:

Bid of General Fireproofing Company, opened April 30, 1907, being the only bid received for furnishing steel for the Belle Fourche project.

[Specifications No. 143.]

⅝-inch twisted square bars, 1,250 pounds; $0.024 per pound.
½-inch twisted square bars, 9,610 pounds; $0.021 per pound.
⅜-inch twisted square bars, 7,300 pounds; $0.02 per pound.
¾-inch twisted square bars, 7,520 pounds; $0.019 per pound.
Welded hoops of ½-inch twisted square bars, 18,100 pounds; $0.045 per pound.
Welded hoops of ⅝-inch twisted square bars, 298,200 pounds; $0.042 per pound.
4-inch I beams, 900 pounds; $0.323 per pound.
4-inch channels, 1,200 pounds; $0.323 per pound.
8¼-foot screens, 16, complete; $10.75 per screen.
10¾-foot screens, 8, complete; $12.85 per screen.

This company was awarded the contract, but instead of furnishing welded hoops of one-half and five-eighths inch bars, straight lengths were obtained at prices of $0.021 and $0.02 per pound, the welding being done by the United States.

LATERAL SYSTEM.

The construction of the lateral system for about 25,000 acres, or one-fourth of the irrigable area, is under contract and work is progressing favorably. This work will be completed by April 1, 1908. The structures are being built by force account, as no bids were received after advertisement.

On April 30, 1907, bids were opened for construction of the lateral system, and the following is an abstract of the proposals received:

Bids opened April 30, 1907, for lateral ditches and structures, sections 1 to 11, Belle Fourche project, South Dakota.

[Specifications No. 138.]

Bidders.

A: Giles & Adams, Belle Fourche, S. Dak.; section 1, $18,411.60; section 2, $18,745.

B: Geo. A. Lane, Gustave, S. Dak.; section 3, $7,000; section 5, $4,470; section 6, $5,000. Will accept only one section.

Bidders.

C: Cole Brothers, Orman, S. Dak.; section 5, $6,300; section 6, $6,474; section 7, $12,700. Will accept only one section.

D: J. W. McNeel, North Platte, Nebr.; section 7, $14,885; section 8, $11,412.50; section 9, $14,985; section 10, $14,435; section 11, $12,175.

Section 1, Bidder A: [a]

Excavation, class A, 52,000 cubic yards: $0.33⅓ per cubic yard.
Excavation, Class B, 1,200 cubic yards; $0.65 per cubic yard.
Excavation, class C, 200 cubic yards: $1.50 per cubic yard.

Section 2, Bidder A: [a]

Excavation, class A, 54,000 cubic yards: $0.33⅓ per cubic yard.
Excavation, class B, 800 cubic yards: $0.65 per cubic yard.
Excavation, class C, 150 cubic yards: $1.50 per cubic yard.

Section 3, Bidder B: [a]

Excavation, class A, 40,000 cubic yards: $0.16¼ per cubic yard.
Excavation, class B, 500 cubic yards: $0.60 per cubic yard.
Excavation, class C, 200 cubic yards: $1 per cubic yard.

Section 4. (No bids received.)

Section 5:

Excavation, class A, 24,000 cubic yards: Bidder B, 16¾ cents; Bidder C, 25 cents per cubic yard.
Excavation, class B, 500 cubic yards: Bidder B, 50 cents; Bidder C, 30 cents per cubic yard.
Excavation, class C, 200 cubic yards: Bidder B, $1; Bidder C, 75 cents per cubic yard.

Section 6:

Excavation, class A, 26,000 cubic yards: Bidder B, 16¼ cents; Bidder C, 22½ cents per cubic yard.
Excavation, class B, 500 cubic yards: Bidder B, 50 cents; Bidder C, 30 cents per cubic yard.
Excavation, class C, 200 cubic yards: Bidder B, $1; Bidder C, 75 cents per cubic pard.

Section 7:

Excavation, class A, 62,000 cubic yards: Bidder C, 20 cents; Bidder D, 23 cents per cubic yard.
Excavation, class B, 500 cubic yards: Bidder C, 30 cents; Bidder D, 75 cents per cubic yard.
Excavation, class C, 200 cubic yards: Bidder C, 75 cents; Bidder D, $1.25 per cubic yard.

Section 8, Bidder D: [a]

Excavation, class A, 50,000 cubic yards: 21 cents per cubic yard.
Excavation, class B, 800 cubic yards: 75 cents per cubic yard.
Excavation, class C, 250 cubic yards: $1.25 per cubic yard.

Section 9, Bidder D: [a]

Excavation, class A, 66,000 cubic yards: 21 cents per cubic yard.
Excavation, class B, 1,000 cubic yards: 75 cents per cubic yard.
Excavation, class C, 300 cubic yards: $1.25 per cubic yard.

Section 10, Bidder D: [a]

Excavation, class A, 61,000 cubic yards: 21 cents per cubic yard.
Excavation, class B, 1,500 cubic yards: 75 cents per cubic yard.
Excavation, class C, 400 cubic yards: $1.25 per cubic yard.

Section 11, Bidder D: [a]

Excavation, class A, 55,000 cubic yards: 21 cents per cubic yard.
Excavation, class B, 500 cubic yards: 75 cents per cubic yard.
Excavation, class C, 200 cubic yards: $1.25 per cubic yard.

Contracts were awarded to George A. Lane for section 3, to Cole Brothers for section 7, and to J. W. McNeel for sections 8, 9, 10, and 11.

Informal bids were subsequently obtained, and part of section 1 awarded to Harley L. Shevling, section 2 to H. T. Adams, and section 4 and part of section 1 to Primus & Wilson.

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[a] Only bidder.

On June 10, 1907, bids were opened for furnishing sewer pipe, and the following is an abstract of the proposals received:

Bids opened June 10, 1907, for furnishing sewer pipe for lateral structures for the Belle Fourche project, South Dakota.

BIDDERS.

A. W. S. Dickey, Kansas City, Mo., $6,851.73; total weight, 1,170,255 pounds; total cost, f. o. b., Belle Fourche, S. Dak., $9,162.98.

B. Monmouth Mining and Manufacturing Company, Monmouth, Ill., $6,848.10; weight, 1,078,100 pounds; total cost, f. o. b., Belle Fourche, S. Dak., $9,192.96.

C. Blackman & Post Pipe Company, St. Louis, Mo., $7,214.48; weight, 1,183,291 pounds; total cost, f. o. b., Belle Fourche, S. Dak., $9,787.94.

ITEM 1.

Single strength 12-inch pipe, 2,000 feet:
Bidder A, 18¾ cents per foot.
Bidder B, 18¾ cents per foot.
Bidder C, 20¼ cents per foot.

ITEM 2.

Single strength 18-inch pipe, 700 feet:
Bidder A, 45 cents per foot.
Bidder B, 45 cents per foot.
Bidder C, 48 cents per foot.

ITEM 3.

Double strength 18-inch pipe, 3,800 feet:
Bidder A, 52½ cents per foot.
Bidder B, 52½ cents per foot.
Bidder C, 55½ cents per foot.

ITEM 4.

Single strength 21-inch pipe, 1,350 feet:
Bidder A, 70 cents per foot.
Bidder B, 70 cents per foot.
Bidder C, 74 cents per foot.

ITEM 5.

Double strength 21-inch pipe, 1,450 feet:
Bidder A, 90 cents per foot.
Bidder B, 90 cents per foot.
Bidder C, 94 cents per foot.

ITEM 6.

Double strength 24-inch pipe, 1,600 feet:
Bidder A, $1.12½ per foot.
Bidder B, $1.12½ per foot.
Bidder C, $1.17½ per foot.

ITEM 7.

Double strength 30-inch pipe, 60 feet:
Bidder A, $1.62½ per foot.
Bidder B, $1.60 per foot.
Bidder C, $1.70½ per foot.

ITEM 8.

21-inch Y branch, 12-inch hole, 3:
Bidder A, $2.36¼ each.
Bidder B, $2.10 each.
Bidder C, $2.49¾ each.

ITEM 9.

18-inch Y branch, 12-inch hole, 3:
Bidder A, $4.05 each.
Bidder B, $3.60 each.
Bidder C, $4.23 each.

Contract was awarded to W. S. Dickey, Kansas City, Mo.

TELEPHONE SYSTEM.

A telephone system is in operation between the head office and the construction camps at diversion dam, inlet canal, and at Belle Fourche dam. This line is being extended to connect with the work at the pressure pipes, tunnel, and the South canal at Vale, S. Dak., and Whitewood Creek.

BUILDINGS.

Office buildings have been constructed and are maintained at the head of the inlet canal, at the Belle Fourche reservoir, and at Vale, S. Dak. A temporary office will be in use at the pressure pipes and tunnel while these are being constructed. Portable houses are in use for this, as the work is of short duration. These buildings are so located as to be used by gate tenders or ditch riders after the construction is done.

A five-room residence was built at the Belle Fourche dam for the use of the resident engineer. Small temporary buildings are also in use at the reservoir for sleeping quarters for the men. The other

buildings located there are a mess house, a small storehouse, ice house, bath house, granary, and barns. The mess is operated for the employees at the reservoir and at the pressure pipes. At the other quarters men obtain their board themselves. A storehouse 100 by 34 feet has been built at Belle Fourche, S. Dak., for storage of supplies.

IRRIGABLE LANDS.

The irrigable land under the project begins about 2 miles below the diversion of Belle Fourche River and extends east for 40 miles, including, besides the valley of the Belle Fourche, those of Indian, Owl, Horse, Dry, Antelope, and Willow creeks on the north side and Whitewood, Cottonwood, and Ninemile creeks on the south side. Fine crops are now raised in these valleys in years that the rainfall is sufficient, but crops can not be depended upon every year without irrigation.

Many of the farm units contain, besides 80 acres of irrigable land, 40 or 80 acres of high or rough land which can not be irrigated, but is valuable to the settler for grazing or in occasional years for dry crops. The open range extends to a great distance on all sides of the project and affords excellent summer feed for the herds of the settlers.

The total irrigable area is 100,000 acres, divided into over 1,000 farms. The slope of the land ranges from very flat on Indian Creek to rolling on Willow Creek. The soil is all fertile and free from alkali or stone. The natural growth in its wild state is sagebrush, cactus, and wild wheat grass. Wherever there is water a good growth of timber is found along the creeks, of which there are many.

A table showing the distribution of the lands is printed on page 269, Fifth Annual Report.

CEMENT.

The cement used on the project is furnished by the Western Portland Cement Company, of Yankton, S. Dak., on contract for 20,000 to 30,000 barrels, entered into during 1906.

TOWN SITES.

The following land has been reserved for a town site, near the center of the project: N. ½ sec. 29, E. ½ NE. ¼ sec. 30, SE. ¼ SE. ¼ sec. 19, and S. ½ SW. ¼ sec. 20, T. 9 N., R. 6 E., B. H. M. This town will be opened in the near future.

Village sites have also been reserved on the NE. ¼ sec. 7, T. 8 N., R. 7 E., and NE. ¼ sec. 14, T. 9 N., R. 4 E., B. H. M.

EXPERIMENTAL FARM.

The NE. ¼ sec. 24, T. 9 N., R. 5 E. has been set aside for an experimental farm. A rabbit-proof fence has been built around it, 60 acres of sod have been plowed, and crops will be planted the coming year.

Suitable buildings will be erected this fall. All experiments are to be conducted by the several branches of the Department of Agriculture and reports made available to the settlers.

EXPENDITURES.

The expenditures on this project are summarized in the following tables:

Expenditures, according to physical features, on Belle Fourche project to June 30, 1907.

Feature.	Engineering and administration.	Building.
Incidental structures:		
Telephone line, 16 miles	$947.96	$4,060.61
Offices		4,849.00
Lodging and boarding houses, barns, etc		8,202.60
Engineer's residence at Belle Fourche reservoir		970.63
2 artesian wells, 1,966 feet deep		2,390.59
Sewer system		1,077.87
Inventory, undistributed		18,874.55
Irrigation structures:		
Diversion dam, headworks, and gates	9,466.94	90,499.94
Crow Creek sluice and gates	4,206.21	53,329.10
Main supply canal	9,947.82	203,780.88
10-foot drop at reservoir	287.00	2,633.04
Belle Fourche reservoir, submerged lands		16,696.48
Belle Fourche dam	23,754.69	91,660.00
North side canal	14,563.77	64,925.27
South side canal and siphon	18,182.68	87,927.31
Lateral system	9,189.46	2,268.00
Highway bridges across inlet canal	416.74	9,336.31
Flood expense, 1907		1,751.62
Irrigable lands:		
Farm unit subdivision and soil examination	16,357.65	
Examination of project as a whole	9,931.22	
Administration of project as a whole	38,336.89	
Total	155,733.03	665,233.80
Grand total	$820,966.83	

Total expenditures, according to purpose and nature, on Belle Fourche project to June 30, 1907.

[Total, $820,966.83.]

	Services.	Traveling.	Subsistence.	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination	$2,684.76	$664.75	$764.97	$1,006.14		$364.32	$6.00	$152.33	
Survey	33,883.72	2,613.78	6,467.30	7,462.26	$60.94	2,883.25	73.84	2,109.92	
Design	10,280.72	243.88	431.05	147.98		255.15	38.62	2.55	$164.90
Subdivision	1,050.20	161.07	5.10	75.51		62.02	6.85		
Building:									
Rights and property	1,373.57	217.10	20.30			40,913.45			
Building	134,112.54	1,764.09	24,282.56	6,885.52	23,691.61	29,628.75	286.62	15,056.74	428,878.04
Administration	29,485.49	2,642.42	516.83	2,526.76		3,003.26	1,483.64	73.66	

UTAH.

STRAWBERRY VALLEY PROJECT.

GENERAL STATEMENT.

The principal facts relating to the Strawberry Valley project are summarized below:

Summary of principal data relating to the Strawberry Valley project.

State: Utah.
Counties: Utah and Wasatch counties, Utah.
Latitude: North, 40° 14′.
Longitude: West, 111° 40′.
Railway connections: Denver and Rio Grande and the San Pedro, Los Angeles and Salt Lake, both roads running through the lands under the project.
Principal markets: Salt Lake City and adjacent mining districts.
Land office for district: Salt Lake City, Utah.
Irrigable land: 30,000 acres.
Location of land: From 5 to 15 miles south of Provo, Utah.
Average elevation: 4,500 to 4,800 feet.
Character of soil: Sandy loam; gravel, with a deep black soil in the lowlands.
Range of temperature: Maximum, 99°; minimum, —18°.
Average rainfall: 18 inches.
Irrigable land: All in private ownership.
Value of irrigated lands: $50 to $200 an acre.
Principal products: Alfalfa (3 crops), hay, cereals, sugar beets, fruits, vegetables.
Duty of water: 1 cubic foot per second at the head gates for every 80 acres.
Watershed area: 200 square miles.
Average annual discharge: 65,600 acre-feet.
Storage reservoir in Strawberry Valley: Area, 6,800 acres; capacity, 110,000 acre-feet.
Storage dam on Strawberry River: Loose rock, with concrete core wall, backed with earth; 45 feet high; length 325 feet; 25 feet wide on top.
Diversion dam on Spanish Fork: Reenforced concrete; 16 feet high; 70 feet long.
Main canals: Length, 30 miles; capacity, 500 second-feet for 3 miles, 180 second-feet for 20 miles, 100 second-feet for 7 miles.
Power developed: 3,000 horsepower.
Power transmission line: 35 miles.
Telephone line: 38 miles.
Wagon road (to Strawberry tunnel): 32 miles.

The Strawberry Valley project contemplates the irrigation of approximately 60,000 acres of mesa and bottom land lying about 60 miles south of Salt Lake City on the east shore of Utah Lake. The principal towns on the project are Provo, Spanish Fork, Payson, Salem, and Springville. Provo is a town of about 8,000 inhabitants, the county seat of Utah county, and the seat of Brigham Young University. Spanish Fork, Springville, and Payson are prosperous country towns, whose population and business will be greatly increased by the building of the project. The Denver and Rio Grande Railway passes through all of these towns and the San Pedro, Los

Angeles and Salt Lake Railway passes through Provo, Spanish Fork, and Payson, thus giving all parts of the project good facilities for shipping out produce.

When completed, the irrigation works will consist of the following features: The Strawberry reservoir, in which it will be possible to impound 110,000 acre-feet of water by erecting a dam 45 feet high across Strawberry River; the Strawberry tunnel, 18,500 feet long, with a capacity of 500 second-feet, by which the water from the Strawberry reservoir is taken through the rim of the Great Basin; concrete diversion dam and headworks on the Spanish Fork, the dam to be 16 feet high and 70 feet long; power canal 3 miles long, having a capacity of 500 second-feet; about 30 miles of main distributing canals, with necessary turnouts and laterals; a hydro-electric power plant that will generate about 3,000 horsepower, and several pumping plants that will be used for pumping water for irrigation purposes.

APPROVAL, AUTHORIZATION, AND ALLOTMENT.

Extensive preliminary investigations were carried on during 1903 and 1904, and on October 2, 1905, a board of engineers found the project feasible.

On December 15, 1905, the project was approved on condition that "all of the complications involved be adjusted, including all conflicts that may exist in regard to water rights; that a sufficient acreage be pledged to secure the return to the reclamation fund of the cost of construction, and that a clean-cut feasible reclamation project, free from all complications of any kind or character, be secured before a dollar is spent in construction."

March 6, 1906, work was authorized to be commenced by force account, as follows:

1. Repairing and extending the road from Castilla to both ends of the Strawberry tunnel.
2. Constructing the rough buildings necessary for men and animals at Castilla and at both ends of the tunnel.
3. Opening up both portals of the tunnel in order that bidders might inform themselves as to the nature of the material and the difficulties to be encountered in the work.

Bids were asked for the construction of the tunnel, and a board of engineers convened at Salt Lake City on August 30, 1906, for the purpose of opening them. No bids were received, and the board recommended that the construction of the tunnel be proceeded with by force account. This recommendation was approved by the Secretary of the Interior, and on September 14, 1906, force-account work was authorized, under the following conditions:

1. That the supervising engineer be directed to proceed with the work by force account at such a rate as he may deem expedient to develop the probable difficulties to be encountered.
2. That the supervising engineer be authorized to purchase such tools and to employ such labor as may be necessary to procure the above development without the construction of an expensive power plant.
3. That the work be readvertised and that proposals be invited about May 1, 1907.

On December 4, 1906, authority was given for the construction by force account of the 3-mile power canal that will carry 500 second-feet of water to the hydro-electric power plant.

TELEPHONE LINE AND TUNNEL ROAD.

A telephone line 38 miles long, extending from Spanish Fork via Diamond Switch to both portals of the Strawberry tunnel, was completed December 1, 1906. Connection was made with the Utah Independent Telephone Company's line at Spanish Fork, thus giving the project access by long-distance 'phone to all parts of Utah reached by the long-distance lines of that company. At present the following parts of the work are accessible by 'phone: West portal of Strawberry tunnel, Hammock Grove (camp of tunnel freighters), Diamond Switch, and the construction camp on the power canal.

During the summer and fall of 1906 a wagon road 32 miles long, extending from Diamond Switch, the United States Reclamation Service shipping point on the Denver and Rio Grande Railway, to both portals of the Strawberry tunnel, was constructed as a primary step in the construction of the Strawberry tunnel. The maximum grade is 7 per cent, with 85 per cent of the road having a maximum grade of less than 5 per cent. During the winter and spring the road is impassable for anything but light rigs on account of the mud caused by the heavy falls of rain and snow, thus making it necessary for all the heavy freighting to be done during the summer months when the roads are dry. The road follows Diamond Fork Canyon for 16 miles, and during the season of high water much work is necessary to prevent Diamond Fork from washing the road away in numerous places. Both the telephone line and tunnel road will be of permanent value in the maintenance and operation of the project after all construction work has been completed.

STRAWBERRY TUNNEL.

Bids for constructing the Strawberry tunnel were asked, as stated in another part of the report, and none being received the work of opening up both portals by force account was inaugurated. During August, 1906, work was commenced on the west portal with one shift, and as soon as it was well opened up two shifts were put on.

It was late in October before the tunnel road was completed to the west portal, and prompt action was necessary in order to get sufficient supplies hauled in to keep the work going during the season of bad roads and to construct rough camp buildings for the protection of men and animals against the severe climate. The camp is located at an elevation of 7,600 feet, and as there was an abundance of good timber near the tunnel a contract was let for the sawing of sufficient lumber to construct the camp buildings and supply timber for the heading.

A contract was let for hauling 500 tons of freight from Diamond Switch, and purchases of large quantities of supplies and materials were made. Work on the erection of the camp buildings and power house was pushed as rapidly as conditions would permit. An ample supply of good water was piped into camp, and a large quantity of dry wood was hauled in and cut.

The heavy falls of snow did not seriously impede the progress of the outside work (constructing the camp and sawing lumber) until the middle of December, when it became so deep that the lumber

contractor was compelled to shut down his mill. The winter was not cold, but a great deal of snow fell, which rendered the roads impassable for the greater part of the time. A considerable quantity of gasoline, lumber, and other freight of a miscellaneous nature had to be hauled during the winter at such times as the freight teams could get over the road, but work in the tunnel was not delayed at any time on account of the lack of supplies or material.

During February and March, 1907, snow fell to the depth of 4 to 6 feet, and for several days at a time communications could not be had with the outside on account of the heavy falls of snow that made the roads impassable and broke down the telephone line. During the spring months, when the snow began to melt, Diamond Fork washed that part of the tunnel road in Diamond Fork Canyon so badly that it was necessary to keep a foreman and a gang of men at work constantly during the high water repairing the road. On account of the difference in altitude between the shipping point, Diamond Switch, and the tunnel, there are times during the spring and fall that a part of the road will be dry and dusty, a part deep with mud, and the upper end covered with snow.

The work in the tunnel has been carried on from one heading at the west portal with two shifts. Electric rock drills supplied with power from gasoline engines are being used to do the drilling in the heading, and fair progress is being made. The best month's progress to date was made during April, when 215.5 linear feet of tunnel were excavated and timbered. The material is a medium lime, and drills and shoots with comparative ease. With the exception of an occasional small flow of water that ran dry in a few days the heading has been dry. Timbers 8 by 8, set 4 feet on center, lagged top and sides, are being used to keep the heading safe for workmen. The labor used in the tunnel comes from the several small towns on the project and from the mining districts of the State, and is first class.

POWER CANAL AND POWER PLANT.

The power canal is a little more than 3 miles in length, and extends from a point on the Spanish Fork to the site for the hydro-electric power plant, located about 3 miles from the town of Spanish Fork. The capacity of this canal is 500 second-feet. The work includes a reenforced concrete diversion dam on the Spanish Fork, 16 feet high, and 70 feet long, two settling basins in the canal for taking out the silt, two tunnels (total length, 1,375 feet), 9,000 feet of lined canal, 5,325 feet of earth canal, one reenforced concrete culvert, and headgate for pressure pipe leading to power plant.

The canal was located in April, and construction work by force account began May 1, 1907. On June 30, 1907, the work was 25 per cent completed.

CEMENT.

On April 23 bids were opened at Provo, Utah, for furnishing 10,000 barrels of cement. The contract was awarded to the Western States Portland Cement Company, Independence, Kans., at $1.65 per barrel, f. o. b. cars Independence, Kans. The following is an abstract of the bids.

Bids opened April 23, 1907, for furnishing 10,000 barrels of cement for Strawberry Valley project, Utah.

[Specifications No. 139.]

Universal Portland Cement Company, Chicago, Ill.: $1.50 barrel, f. o. b. cars factory; freight to project, $1.70; total cost, $3.20 per barrel.
Western States Portland Cement Company, Independence, Kans.: $1.65 per barrel, f. o. b. cars factory; freight to project, $1.25; total cost, $2.90 per barrel.
The Portland Cement Company, Denver, Colo.: $2.05 per barrel; freight to project, 94 cents; total cost, $2.99 per barrel.

ELECTRICAL MACHINERY.

On April 8, 1907, a contract was awarded to the General Electric Company, of Schenectady, N. Y., for furnishing the electrical machinery for the hydro-electric power plant on the power canal, and for the power houses at both ends of the Strawberry tunnel. Total amount of this contract is $26,000. Following is an abstract of the bids.

Bids opened February 19, 1907, for electrical machinery for Strawberry Valley project, Utah.

BIDDERS.

A. Salt Lake Hardware Company, Salt Lake, Utah, $27,000; alternate, $25,335.08.
B. Salt Lake Electric Supply Company, Salt Lake, Utah, $33,334.
C. Trent Engineering Company, Salt Lake, Utah, $34,000.
D. Allis-Chalmers Company, Milwaukee, Wis., bid only on 4 items.
E. Westinghouse Electric and Manufacturing Company, Pittsburg, Pa., $27,000.08; alternate, $25,335.08.
F. General Electric Company, Schenectady, N. Y., $26,119.

ITEMS.

Generators (2):
Bidder A, $4,879.50 each, 450 kilowatts, 11,000 volts, delivery 7 months.
Bidder D, $5,184 each, 450 kilowatts, 11,000 volts, delivery 4 months.
Bidder E, $4,879.50 each, 450 kilowatts, 11,000 volts, delivery 6½ months.
Generators (2), first alternate:
Bidder A, $3,924 each, 550 kilowatts, 2,200 volts, delivery 6⅝ months.
Bidder B, $6,799 each, 470 kilowatts, 11,000 volts, delivery 5¼ months.
Bidder C, $6,887.50 each, 470 kilowatts, 11,000 volts, delivery 5½ months.
Bidder E, $3,924 each, 550 kilowatts, 2,200 volts, delivery 6½ months.
Bidder F, $5,137.50 each, 425 kilowatts, 11,000 volts, delivery 5¾ and 6¼ months.
Generators (2), second alternate:
Bidder F, $5,650 each, 475 kilowatts, 11,000 volts, delivery 5¼ and 6 months.
Generators (2), third alternate:
Bidder F, $4,465 each, 360 kilowatts, 11,000 volts, delivery 6 months.
Generators (2), fourth alternate:
Bidder F, $3,985 each, 360 kilowatts, 11,000 volts, delivery 5¼ and 5¾ months.
Exciter generators (2):
Bidder A, $538.50 each, 50 kilowatts, 125 volts, delivery 7 months.
Bidder C, $725 each, 50 kilowatts, 125 volts, delivery 5¼ months.
Bidder E, $538.50, 55 kilowatts, 125 volts, delivery 6½ months.
Exciter generators (2), first alternate:
Bidder A, $538.50 each, 55 kilowatts, 125 volts, delivery 6⅝ months.
Bidder B, $597.50, 55 kilowatts, 125 volts, delivery 5¼ months.
Bidder D, $711, 60 kilowatts, 120 volts, delivery 4 months.
Bidder F, $585 each, 45 kilowatts, 125 volts, in stock.
Exciter generators (2), second alternate:
Bidder F, $760 each, 60 kilowatts, 125 volts, delivery 1 month.

Exciter panel (1):
Bidder A, $318, 50 kilowatts, 125 volts, delivery 7 months.
Bidder B, not itemized, 50 kilowatts, 125 volts, delivery 5¼ months.
Bidder C, not itemized, 50 kilowatts, delivery 5¼ months.
Bidder E, $318, 55 kilowatts, delivery 6½ months.
Bidder F, $200, 50 kilowatts, delivery 2½ months.
Exciter panel, alternate:
Bidder A, $318, 55 kilowatts, 125 volts, delivery 6⅝ months.
Generator panels (2):
Bidder A, $1,302 each, 450 kilowatts, 11,000 volts, delivery 7 months.
Bidder B, not itemized, 450 kilowatts, delivery 5¼ months.
Bidder C, not itemized, 475 kilowatts, delivery 5¼ months.
Bidder E, $1,302 each, 450 kilowatts, 11,000 volts, delivery 6½ months.
Bidder F, $475 each, 450 kilowatts, 11,000 volts, delivery 2½ months.
Generator panels (2), alternate:
Bidder A, $641.50 each, 550 kilowatts, 2,200 volts, delivery 6⅝ months.
Bidder E, $641.50 each, 550 kilowatts, 2,200 volts, delivery 6½ months.
Line panels (2):
Bidder A, $510.50 each, 300 kilowatts, delivery 7 months.
Bidder B, not itemized, 300 kilowatts, delivery 5¼ months.
Bidder C, not itemized, 300 kilowatts, delivery 5¼ months.
Bidder E, $510.50 each, 300 kilowatts, delivery 6½ months.
Bidder F, $641 each, 300 kilowatts, delivery 2½ months.
Line panels (2), alternate:
Bidder A, $419 each, 300 kilowatts, delivery 6⅝ months.
Bidder E, $419 each, 300 kilowatts, delivery 6½ months.
Lightning arresters (3):
Bidder A, $88.34 each, 10,000 volts, delivery 7 months.
Bidder B, not itemized, 10,000 volts, delivery 5¼ months.
Bidder C, not itemized, 10,000 volts, delivery 5¼ months.
Bidder E, $88.34 each, 10,000 volts, delivery 6½ months.
Bidder F, $455 per set, 10,000 volts, delivery 2½ months.
Lightning arresters (6):
Bidder A, $128.34 each, 20,000 volts, delivery 7 months.
Bidder B, not itemized, 20,000 volts, delivery 5¼ months.
Bidder C, not itemized, 20,000 volts, delivery 5¼ months.
Bidder E, $128.34 each, 20,000 volts, delivery 6½ months.
Bidder F, price included in preceding item.
Terrill regulator:
Bidder A, $249, delivery 7 months.
Bidder B, not itemized, delivery 5¼ months.
Bidder C, not itemized, delivery 5¼ months.
Bidder E, $249, delivery 6½ months.
Bidder F, $213, delivery 2½ months.
Transformers (3):
Bidder A, $844.34 each, 100 kilowatts, 11,000 to 22,000 volts, delivery 7 months.
Bidder B, $1,085.33⅓ each, 100 kilowatts, 11,000 to 22,000 volts, delivery 5¼ months.
Bidder C, $1,100 each, 100 kilowatts, 11,000 to 22,000 volts, delivery 5¼ months.
Bidder E, $844.34 each, 100 kilowatts, 11,000 to 20,000 volts, delivery 6½ months.
Bidder F, $932 each, 100 kilowatts, 11,000 to 22,000 volts, delivery 3 months.
Transformers (3), first alternate:
Bidder A, $844.34 each, 100 kilowatts, 2,200 to 22,000 volts, delivery 6⅝ months.
Bidder E, $844.34 each, 100 kilowatts, 2,200 to 20,000 volts, delivery 6½ months.
Transformers (3), second alternate:
Bidder A, $583.34 each, 50 kilowatts, 2,200 to 11,000 volts, delivery 6⅝ months.
Bidder E, $583.34 each, 50 kilowatts, 2,000 to 11,000 volts, delivery 6½ months.

Transformers (3), 60 kilowatts:
Bidder A, $693.34 each, 20,000 to 2,200 volts, delivery 7 months.
Bidder B, $702 each, 20,000 to 2,200 volts, delivery 5½ months.
Bidder C, $710 each, 20,000 to 2,200 volts, delivery 5½ months.
Bidder E, $693.34 each, 20,000 to 2,200 volts, delivery in 6½ months.
Bidder F, $602 each, 20,000 to 2,200 volts, delivery 4 months.
Transformers (3), 40 kilowatts:
Bidder A, $493.34 each, 20,000 to 2,200 volts, delivery 7 months.
Bidder B, $600 each, 10,000 to 2,200 volts, delivery 5½ months.
Bidder C, $606.66⅔ each, 20,000 to 2,200 volts, delivery 5½ months.
Bidder E, $493.34 each, 20,000 to 2,200 volts, delivery 6½ months.
Bidder F, $513 each, 20,000 to 2,000 volts, delivery 3 months.
Motor generator set, 75 kilowatts, 200 horsepower:
Bidder A, $2,866, 250 volts, delivery 7 months.
Bidder D, $3,432, 250 volts, delivery 4 months.
Bidder E, $2,866, 125 kilowatts, delivery 6 months.
Motor generator set, first alternate, 75 kilowatts:
Bidder B, $3,390, 225 horsepower, 250 volts, delivery 5½ months.
Bidder C, $3,430, 225 horsepower, 250 volts, delivery 5½ months.
Bidder F, $3,237, 225 horsepower, 2,080 volts, delivery 4¾ months.
Motor generator set, second alternate:
Bidder F, $2,837, 75 kilowatts, 175 horsepower, 2,080 volts, delivery 4½ months.
Motor generator set, third alternate:
Bidder F, $3,187, 75 kilowatts, 225 horsepower, 2,080 volts belted, delivery 4 months.
Motor generator set, fourth alternate:
Bidder F, $2,777, 75 kilowatts, 225 horsepower, 2,080 volts belted, delivery 3½ months.
Motor generator set, 50 kilowatts:
Bidder A, $1,851, 125 horsepower, 250 volts, delivery 7 months.
Bidder B, $2,116, 125 horsepower, 250 volts, delivery 5½ months.
Bidder C, $2,150, 125 horsepower, 250 volts, delivery 5½ months.
Bidder E, $1,851, 125 horsepower, 125 volts, delivery 5 months.
Bidder F, $2,477, 125 horsepower, 2,080 volts, delivery 4½ months.
Motor generator set, first alternate:
Bidder D, $1,961, 45 kilowatts, 125 horsepower, 250 volts, delivery 4 months.
Bidder F, $2,017, 45 kilowatts, 125 horsepower, 2,080 volts belted, delivery 3 months.
Motor generator set, second alternate:
Bidder F, $2,121, 60 kilowatts, 125 horsepower, 2,080 volts belted, delivery 3 months.
Transformers, 600 watts (6):
Bidder A, $21.17 each, 2,200 to 110 volts, delivery 7 months.
Bidder B, $20.50 each, 2,200 to 110 volts, delivery 5½ months.
Bidder C, $20.83⅓ each, 2,200 to 110 volts, delivery 5½ months.
Bidder E, $21.17 each, 2,200 to 110 volts, delivery 6½ months.
Bidder F, $19.83⅓ each, 2,200 to 110 volts, delivery 1½ months.

On May 15, 1907, a contract was awarded to the Dayton Globe Iron Works, of Dayton, Ohio, for furnishing turbines and other apparatus for the hydro-electric power plant. The amount of the contract is $12,500. The following is an abstract of the proposals received:

Bids opened April 20, 1907, for furnishing water wheels for the Strawberry Valley project, Utah.

BIDDERS.

A. Dayton Globe Iron Works, Dayton, Ohio.
B. S. Morgan Smith Company, York, Pa.
C. Ingersoll Machinery Company Trump Manufacturing Company, Springfield, Ohio.
D. Salt Lake Hardware Company, f. o. b. Dayton, Ohio.

ITEM 1.

Two 75-horsepower turbine water wheels, with pivot-gate control, set in main flume, complete, as specified.
Bidder A, $1,060 each, delivery 75 days.
Bidder B, $1,530 each, delivery 60 days.
Bidder C, $973 each, delivery 90 days.
Bidder D, $2,795 each, delivery 90 days.

ITEM 1a (FIRST ALTERNATE).

Two 75-horsepower turbine water wheels, with cylinder-gate control, set in main flume, complete, as specified:
Bidder A, $1,100 each, delivery 75 days.
Bidder B, $1,530 each, delivery 60 days.

ITEM 1b (SECOND ALTERNATE).

Additional price for either of the above 75-horsepower turbines set in a branch steel flume, attached to main flume with a gate valve, as specified:
Bidder A, $268 each, delivery (additional time required) 10 days.
Bidder B, $600 each, delivery (additional time required) 30 days.
Bidder C, $262 each, delivery (additional time required) 10 days.
Bidder D, $833.50 each, delivery (additional time required) 30 days.

ITEM 2.

Two 600-horsepower turbine water wheels, with pivot-gate control, set in main flume, complete, as specified:
Bidder A, $4,100 each, delivery 90 days.
Bidder B, $3,992 each, delivery 60 days.
Bidder C, $3,342 each, delivery 90 days.
Bidder D, $5,052.50 each, delivery 60 days.

ITEM 2a (FIRST ALTERNATE).

Two 600-horsepower turbine water wheels, with cylinder-gate control, set in main flume, complete, as specified:
Bidder A, $4,200 each, delivery 90 days.
Bidder B, $3,992 each, delivery 60 days.

ITEM 2b (SECOND ALTERNATE).

Additional price for either of the above 600-horsepower turbines set in a branch steel flume, attached to main flume with a gate valve, complete, as specified:
Bidder A, $1,708 each, delivery (additional time required) 10 days.
Bidder B, $3,200 each, delivery (additional time required) 30 days.
Bidder C, $2,100 each, delivery (additional time required) 10 days.
Bidder D, $1,827.50 each, delivery (additional time required) 30 days.

ITEM 3.

Two 1,100-horsepower turbine water wheels, with pivot-gate control, set in main flume, complete as specified:
Bidder A, $6,000 each, delivery 120 days.
Bidder B, $6,296 each, delivery 120 days.
Bidder C, $6,396 each, delivery 180 days.
Bdder D, $8,492.50 each, delivery 120 days.

ITEM 3A (FIRST ALTERNATE).

Two 1,100-horsepower turbine water wheels, with cylinder gate control, set in main flume, complete as specified:
Bidder A, $6,200 each, delivery 120 days.
Bidder B, $6,296 each, delivery 120 days.

ITEM 3B (SECOND ALTERNATE).

Additional price for either of the above 1,100-horsepower turbines set in a branch steel flume, attached to main flume with a gate valve, complete as specified:

Bidder A, $2,382 each, delivery (additional time required), 15 days.
Bidder B, $4,000 each, delivery (additional time required), 30 days.
Bidder C, $3,570 each.
Bidder D, $2,902 each, delivery (additional time required), 60 days.

ITEM 4.

Two steel flumes fitted for three turbines, approximate length 35 feet, complete as per specifications:

Bidder A, 5.4 cents per pound.
Bidder B, 4½ cents per pound.
Bidder C, 6 cents per pound.
Bidder D, $5,536.50 each, delivery 60 days.

ITEM 5.

Two oil-pressure governors for 600-horsepower turbines, as per specifications, complete:

Bidder A, $1,900 each.
Bidder B, $1,550 each.
Bidder C, $1,500 each.
Bidder D, $1,800 each.

ITEM 6.

Two oil-pressure governors for 1,100-horsepower turbines, as per specifications, complete:

Bidder A, $1,900 each.
Bidder B, $2,550 each.
Bidder C, $1,700 each.
Bidder D, $2,400 each.

ITEM 7.

Two mechanical governors for 75-horsepower turbine, as per specifications, complete:

Bidder A, $500 each.
Bidder B, $350 each.
Bidder C, $200 each.
Bidder D, $500 each.

The hydro-electric power plant will develop when completed approximately 3,000 horsepower. This power is to be used in the construction of the Strawberry tunnel, for supplying power for pumping for irrigation purposes, and for furnishing light and power to the near-by towns. For the present only sufficient machinery will be installed in the plant to furnish power for the construction of the Strawberry tunnel and for lighting purposes in the town of Spanish Fork, which is within 3 miles of the power house.

DIAMOND SWITCH STOREHOUSES.

At Diamond Switch a parcel of land has been leased for use as a receiving and forwarding point for machinery and construction materials. The Denver and Rio Grande Railway has put in a siding there, and given the Reclamation Service a lease on the railroad land in that vicinity.

Three large storehouses, a stable that will accommodate 24 horses, and several dwelling houses for employees have been erected. The machinery and construction material received at this point is forwarded to both the Strawberry tunnel and power canal.

EXPENDITURES.

The expenditures to June 30, 1907, are summarized in the following tables:

Expenditures, according to physical features, on Strawberry Valley project to June 30, 1907.

Feature.	Engineering and administration.	Building.
Incidental structures:		
Telephone line		$11,111.89
Diamond Fork road		30,477.62
Diamond Switch camp		7,430.13
Hammock Grove buildings		694.20
Irrigation structures:		
Gaging streams	$31.58	
Transmission line		404.31
Hydro-electric power plant		819.11
Power canal		40,797.71
Strawberry tunnel		95,916.05
Examination of project as a whole	36,128.69	
Administration of project as a whole	10,000.00	
Total	46,160.27	187,651.02
Grand total	$233,811.29	

Total expenditures, according to purpose and nature, on Strawberry Valley project to June 30, 1907.

[Total $233,811.29.]

	Services.	Traveling.	Subsistence.	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination	$2,306.94	$825.50	$241.33	$997.70	$2.20	$922.72	$1,155.49	$124.14	$21.55
Survey	18,287.26	2,967.02	2,798.80	2,237.37	65.15	976.07	846.27	1,192.10	.....
Design	534.74	35.65	4.26	15.61	.....	2.00	11.63	.....	60.93
Subdivision	21.86	17.97	.....	.13	.....	.19	1.26	.....	.....
Building:									
Rights and property	225.00	154.00	.....	.....	.....	.....	.....	.....	.....
Building	99,553.88	1,619.13	31,286.37	23,055.97	4,387.35	44,906.87	776.93	3,718.73	9,518.32
Administration	5,833.10	1,106.89	5.07	96.65	.....	774.48	118.71	.....	.....

PROPOSED BEAR LAKE PROJECT.

The proposed Bear Lake project involves the entire Bear River drainage, and possibly areas in Wyoming and Idaho. In view of the importance attached to the possible development, the hydrographic inquiry has been continued and somewhat extended during the last year, but no detailed surveys have been made. The general conditions are fully described in the Third Annual Report of the Reclamation Service, second edition.

The net expenditures to June 30, 1907, are $18,761.28.

PROPOSED UTAH LAKE PROJECT.

The proposed Utah Lake project is fully described in the Third Annual Report, second edition. This project is not considered feasible at present, and all active work has been discontinued.

The net expenditures to June 30, 1907, are $34,040.05.

WASHINGTON.

OKANOGAN PROJECT.

GENERAL STATEMENT.

The general features of the Okanogan project are summarized below:

Summary of principal data relating to Okanogan project.

County: Okanogan.
Township: 33 and 34 north, ranges 25 to 27 east.
Latitude: 48° 30′.
Longitude: 119° 40′.
Average elevation: 1,000 feet.
Nearest railroad: Great Northern.
Nearest station: Oroville, 50 miles.
Principal market: Local.
Irrigable area: 8,000 acres.
Character of soil: Volcanic ash, sand, and gravel.
Range of temperature: Maximum, 105°; minimum, 10°.
Average rainfall on irrigable lands: 8 inches.
Farm unit: 40 acres.
Value of irrigated land: $200 to $500 per acre.
Principal products: Fruit, hay, nuts, vegetables, and grain.
Duty of water: 3 acre-feet per acre per annum (diverted).
Watershed area: 140 square miles.
Average rainfall: Drainage area, 17 inches.
Average annual discharge: 30,000 acre-feet.
Capacity of reservoir: 15,000 acre-feet.
Reservoir area: 650 acres (450 in Conconully reservoir, 200 in Salmon Lake reservoir).
Type of dam: Earth embankment.
Height of dam: 60 feet.
Lenth of dam: 1,000 feet.
Diversion dam: Concrete, 50 feet long, 4 feet high.
Length of main canal and main laterals: 20 miles, 100 to 30 second-feet.
Length of small laterals: 30 miles, 30 to 35 second-feet.

The Okanogan project will provide water for the irrigation of about 10,000 acres, of which 1,350 acres have old water rights, leaving 8,650 acres to pay for the project. The water supply is obtained from Salmon River, a stream which drains about 152 square miles in the eastern foothills of the Cascade Mountains.

Investigation of the project by the Reclamation Service was commenced in 1903 and continued in 1904. In April, 1905, a board of engineers visited the project and recommended that the investigations be continued and completed, which recommendation was approved. In October, 1905, another board recommended that it be authorized for construction. This recommendation was approved by the Secretary of the Interior December 2, 1905.

RESERVOIRS.

To utilize the entire flow of Salmon River in years of low run-off a total storage capacity of 13,000 acre-feet is necessary. This storage is obtained in Salmon Lake reservoir and Conconully reservoir.

Salmon Lake reservoir, a natural lake about 3½ miles long, immediately east of the town of Conconully, is on a small branch of the North Fork of Salmon River. It has an available capacity of 2,000 acre-feet, the low-water elevation being 2,285 feet and the high-water 2,295 feet above sea level. The inlet canal has a capacity of 13 second-feet and is lined with paving. The outlet is through a simple concrete structure. No dam is used for this reservoir.

Conconully reservoir, immediately south of the town of Conconully, will be created by building an earthen dam across Salmon River below the junction of the North and West forks. The capacity of the reservoir will be 13,000 acre-feet. The dam will have a maximum height of 60 feet and a length of 1,000 feet. The high-water elevation is 2,287 feet above sea level, and the maximum draft is 52 feet. The outlet will be through a concrete-lined tunnel and will be controlled by two 36-inch cast-iron gates. In April, 1907, construction by force account was commenced at dam site No. 1, but on opening the cut-off trenches it was found that previous exploration by borings had not revealed the true nature of the material below the surface, which was found unsuitable for dam foundation. A board of engineers, after examining the work on May 22, 1907, recommended that this site be abandoned and that operations be transferred to dam site No. 2. This recommendation was approved and construction work at the latter site is now in progress by force account.

CANALS AND DISTRIBUTION SYSTEM.

After passing the Conconully reservoir the water will follow the natural bed of Salmon River for about 12 miles to the point of diversion, which is at an elevation of 1,371 feet. The diversion is accomplished by a concrete weir 50 feet long and 4 feet high. The main canal has a capacity of 100 second-feet. Irrigation commences about 1 mile below the diversion weir. There will be about 20 miles of main canals and main laterals, varying in capacity from 100 to 30 second-feet, and about 30 miles of small laterals with a capacity of less than 30 second-feet. About one-half mile of canal will be lined with concrete. The structures in the distribution system will all be of wood, except two drops in the main canals, which will be of concrete.

The canals and distribution system are now being constructed almost entirely by small contracts, some special work being done by force account.

IRRIGABLE LANDS.

The distribution of irrigable lands is shown by the following table:

Irrigable lands in Okanogan project, Washington, in acres.

[Total acres irrigable, 10,830.5.]

Township and range.	Total area affected.	Nonirrigable and subirrigable.	Irrigable public land.	Irrigable private land.	North of Salmon River.		South of Salmon River.	
					Subject to water right application.	Old water right.	Subject to water right application.	Old water right.
T. 34 N., R. 27 E.	3,155	691	2,217	247	2,464	.....	.....	.....
T. 34 N., R. 26 E.	9,041	3,172	586	5,283	5,621	248	.....	.....
T. 33 N., R. 26 E.	3,842	1,885	183	1,774	846	365	425	321
T. 32 N., R. 25 E.	112	62	.....	50	.....	.....	40	10
T. 33 N., R. 25 E.	973	686	.....	287	.....	.....	60	227
T. 34 N., R. 25 E.	720	516.5	.....	203.5	.....	.....	20	183.5
Totals	17,843	7,012.5	2,986	7,844.5	8,931	613	545	741.5

The irrigable lands have an elevation of 850 to 1,350 feet above sea level, and lie in a series of benches sloping toward Okanogan River. The soil is mainly sand, light loam, and volcanic ash. Irrigated lands in alfalfa yield a profit on a valuation of $100 per acre, and lands in fruits or nuts, for which the soil is specially adapted, yield profits on a much higher valuation. Without irrigation the lands are practically worthless.

WATER USERS' ASSOCIATION.

The Okanogan Water Users' Association was organized in October, 1905, and through this organization all required private lands have been committed to the project.

PURCHASE OF LANDS AND RIGHT OF WAY.

All the lands necessary for the storage works have been purchased at a total cost of about $30,000. The lands necessary for right of way for the canals were all patented subsequent to 1888; consequently it has not been necessary to acquire right of way by purchase.

MATERIAL AND EQUIPMENT.

Cement to the amount of 2,520 barrels has been purchased from the Pacific Portland Cement Company. Gates and necessary construction equipment are either en route or already on the ground.

EXPENDITURES.

The expenditures to June 30, 1907, are summarized in the following tables:

Expenditures, according to physical features, on the Okanogan project to June 30, 1907.

Feature.	Engineering and administration.	Building.
Incidental structures:		
Office quarters, corrals, etc	$250.00	$2,591.11
Telephone line, 16 miles, headquarters to dam	30.00	1,999.88
Irrigation structures:		
Inlet canal to Salmon Lake	150.00	1,494.78
Outlet works and canal from Salmon Lake	75.00	175.00
Conconully reservoir, lands submerged	700.00	29,415.81
Conconully dam	1,800.00	29,911.85
Diversion weir	125.00	2,999.46
Main canals and distribution system	4,255.96	73,021.24
Irrigable lands:		
Farm unit subdivision and land classification	1,596.11	.....
Examination of project as a whole	28,065.83	.....
Administration of project as a whole	6,999.20	.....
Total	44,047.10	141,609.13
Grand total	$185,656.23	

Total expenditures, according to purpose and nature, on Okanogan project to June 30, 1907.

[Total, $185,656.23.]

	Services.	Traveling.	Subsistence.	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination	$1,056.36	$220.47	$158.46	$179.87	.....	$313.71	.....	.....	$30.21
Survey	11,216.71	1,675.63	2,119.22	2,661.23	$4.50	2,967.54	.....	$408.80	.....
Design	1,706.80	114.67	20.88	.....	.....	47.88	$10.14	.....	72.53
Subdivision	981.44	169.63	204.40	.46	.....	59.18	1.16	38.52	.....
Building:									
Rights and property	643.07	219.83	66.75	.....	27,110.00	183.32	.....	67.60	.....
Building	23,635.04	311.45	28.32	9,066.14	14,786.94	3,916.47	4.31	2,032.54	60,841.13
Administration	11,151.73	1,625.44	273.95	1,374.11	.....	1,540.36	290.96	46.37	.....

YAKIMA DISTRICT PROJECTS.

GENERAL STATEMENT.

A detailed statement of the scope and important features of the Yakima district projects appeared in the fifth annual report and need be only briefly reviewed here.

This district comprises the entire Yakima Valley, extending from the eastern slope of the Cascades to Columbia River. It has been divided into five distinct units or subprojects, as follows: Kittitas, Tieton, Wapato, Sunnyside, and Benton. These will be treated independently, this general statement concerning itself only with features and operations affecting the subprojects as a whole.

Investigations in this district were begun in 1905, and have passed from preliminary studies of all subprojects to actual construction of two. Yakima River and its tributaries are the sources of water

supply for all the projects, and as the low-water flow of these streams, which occurs in summer, was entirely appropriated, storage must be relied upon during the low-water season to furnish water for irrigating new lands. It is estimated that ultimately about 400,000 acres may be reclaimed, and it is believed that in Lakes Clealum, Kachess, and Keechelus, Bumping Lake and McAllister Meadows adequate storage can be developed.

It is stated above that the entire low-water flow of the Yakima River, amounting to about 2,000 second-feet, was appropriated. It should be noted, however, that it was vastly overappropriated by the fifty or more diverters, and before any projects could be approved or construction begun, it was necessary to adjust existing rights so that the aggregate claims would not exceed the total low-water flow of the stream. This was successfully and amicably accomplished early in 1906.

STORAGE.

In the following table are given summarized storage data of the Yakima basin as now contemplated, but it should be added that if the need arises, additional storage to the extent of at least 100,000 acre-feet can be secured by increasing the height of Keechelus dam, and by utilizing some of the higher and smaller lakes in the Clealum watershed.

Reservoir sites in Yakima basin.

Names.	Drainage area.	Annual mean run-off.	Type of dam.	Height of dam.	Capacity.
	Sq. miles.	*Acre-feet.*		*Feet.*	*Acre-feet.*
McAllisters Meadows	191	580,000	Earth...	102	25,000
Bumping Lake	52	188,000	....do...	40	30,000
Lake Keechelus	57	207,000	....do...	46	98,000
Lake Kachess	64	219,000	....do...	73	225,000
Lake Clealum	210	654,000	....do...	138	426,000
Total	574	1,848,000	.....	.....	804,000

The construction of these reservoirs need only keep pace with the development of the irrigation projects, and to meet immediate requirments only temporary low dams need be constructed at two of the lakes, which work is now partially completed.

The Yakima basin is subject to occasional violent floods in the fall of the year, these occurring rarely at intervals shorter than ten years. Such a flood occurred in November, 1906, and it is of interest to note that these reservoirs when fully constructed will regulate such flood to the extent of absorbing the entire flow in the main river and a portion of the flow in Naches River. When the extensive damage to railroad property, county bridges, and farm lands is taken into consideration, the value of these reservoirs as flood regulators becomes an important economic factor.

M'ALLISTER MEADOWS.

This reservoir site is situated on the headwaters of Tieton River and will be held for future possible needs. It is not in itself a good

reservoir site on account of its restricted capacity and its relatively high cost per acre-foot of storage. Its chief value lies in its location and relation to the Tieton project. The Tieton River low-water flow will be taxed to its capacity to supply water for the Tieton project. Gagings of the river, moreover, indicate that its summer flow has a material daily fluctuation, which can be equalized by small storage at McAllister Meadows. Such storage, if needed at all, will not be required until nearly all lands of the Tieton project are irrigated, and no immediate dam construction is contemplated.

BUMPING LAKE.

This lake is situated on the headwaters of Bumping River, a tributary of Naches River, which in turn is a tributary of Yakima River. Two feasible dam sites exist at this reservoir site, one immediately at the mouth of the lake, and the other a half mile below. The former, on examination, revealed a loose slide-rock formation on left bank of river, while the latter was found to be underlain with a very tight cement-gravel formation. The lower site was adopted. Plans and specifications were accordingly prepared, and bids called for, to be opened at Portland, Oreg., November 15, 1906. No bids were received. Bids were again called for, to be opened July 1, 1907, with the same result.

This reservoir site is distant 45 miles from Naches City, the nearest railroad station, the last 20 miles of which is merely a trail. To facilitate the construction of the dam a wagon road was necessary, and the specifications provided that such a road would be completed by January 1, 1907.

This route had been selected for a State and county road, appropriations for the construction of same having already been made, and dependence had been placed on this in preparing specifications. It developed, however, that the appropriations were inadequate, and the Government accordingly offered to cooperate with the State, in the hope that the road would be completed before the end of the year. A portion of the work, done by the Government, was by contract on competitive bidding and a portion by force account. The State, owing to lack of funds and to adverse weather conditions, soon withdrew from the field, while the Government increased its force in an attempt to complete the road in the specified time. Unprecedented floods, an unusually rigorous winter, and adverse labor conditions combined to make this impossible, and the work was discontinued the latter part of December, with the following accomplished:

Length of road opened	miles	16
Grubbing and clearing	acres	39
Earth excavation	cubic yards	9,880
Rock-retaining wall with rock fill	do	3,325
Rock fill in cribs	do	3,480
Round logging in cribs	linear feet	8,726
Bridges erected	do	474
Corduroy road built	do	720

The above refers only to force-account work, the contract job being a line change of about 2 miles and repairs of an existing road.

The last legislature made an appropriation of $40,000 to complete this road and extend it over the Cascade Summit, and it is believed

the work will be completed during the calendar year 1907. Until this road is completed by the State, the construction of Bumping Lake dam should not be begun.

LAKE KEECHELUS.

This lake is situated on the headwaters of Yakima River. The final dam contemplated for this reservoir is an earthen structure 46 feet high, which will impound 98,000 acre-feet of water. Should it be desirable, a dam to the height of 64 feet that will impound 142,000 acre-feet may be feasible. To meet immediate requirements a temporary crib dam was designed, bids for the construction of which were opened September 1, 1906.

Bids opened September 1, 1906, for construction of Keechelus crib dam.

BIDDERS.

A. Robert Wakefield, Portland, Oreg., $23,262.
B. International Contracting Company, Seattle, Wash., $22,295.
C. Standard Construction Company, Portland, Oreg., $17,750.
D. C. E. Lum, North Yakima, Wash., $19,264.

ITEM 1.

Wet excavation, 1,500 cu. yds.:
Bidder A, $2.90 per cu. yd.
Bidder B, $3 per cu. yd.
Bidder C, $5 per cu. yd.
Bidder D, $3.75 per cu. yd.

ITEM 2.

Dry excavation, 3,500 cu. yds.:
Bidder A, 95 cents per cu. yd.
Bidder B, 90 cents per cu. yd.
Bidder C, 60 cents per cu. yd.
Bidder D, 50 cents per cu. yd.

ITEM 3.

Round logs, 28,000 lin. ft.:
Bidder A, 22 cents per lin. ft.
Bidder B, 20 cents per lin. ft.
Bidder C, 10 cents per lin. ft.
Bidder D, 12 cents per lin. ft.

ITEM 4.

Hewn timber, 60 M feet B. M.:
Bidder A, $40 per M ft. B. M.
Bidder B, $40 per M ft. B. M.
Bidder C, $30 per M ft. B. M.
Bidder D, $26 per M ft. B. M.

ITEM 5.

Sawed lumber, 31 M feet B. M.:
Bidder A, $45 per M ft. B. M.
Bidder B, $45 per M ft. B. M.
Bidder C, $30 per M ft. B. M.
Bidder D, $29 per M ft. B. M.

ITEM 6.

Flashboards (100):
Bidder A, $1.60 each.
Bidder B, $1.50 each.
Bidder C, $1 each.
Bidder D, $1 each.

ITEM 7.

Riprap, 60 cu. yds.:
Bidder A, $12 per cu. yd.
Bidder B, $5 per cu. yd.
Bidder C, $2 per cu. yd.
Bidder D, $3.50 per cu. yd.

ITEM 8.

Rock fill, 2,400 cu. yds.:
Bidder A, $1.98 per cu. yd.
Bidder B, $2 per cu. yd.
Bidder C, $1 per cu. yd.
Bidder D, $2.40 per cu. yd.

All bids were rejected, and the work was immediately readvertised, on the basis of cost plus a percentage. Only two bids were received, and as these were not satisfactory they were rejected. The work was then undertaken by force account, being carried on throughout the winter under unusually adverse weather conditions. These and unprecedented floods in November had the effect of largely increasing the estimated quantities of excavation and cost of construction. The dam was completed April 19, 1907. The final quantities and approxi-

mate unit costs of the work, subject yet to a credit for salvage of plant and buildings, are as follows:

Quantities and unit costs, Keechelus crib dam.

Item.	Unit.	Quantity.	Unit cost.	Total.
Wet excavation	Cubic yard	2,737	$2.39	$6,513
Dry excavation	do	4,147	1.25	5,190
Round logs	Linear foot	23,177	.27	6,213
Hewn timber	M foot B. M	1.50	28.70	43
Sawed lumber	do	96.45	48.77	4,704
Flashboards	One	82	1.18	97
Riprap	Cubic yard	20	6.00	120
Rock fill	do	2,159	2.03	4,378
Piling	Linear foot	377	1.07	403
Engineering				1,332
Total				28,993

The dam stores 12,000 acre-feet, and is of the crib, overflow type, with a crest length of 160 feet, and provided with three 4 by 6 foot openings controlled by flashboards.

LAKE KACHESS.

This lake is situated on the headwaters of Kachess River, a tributary of Yakima River. The final dam designed for this reservoir is an earthen structure, 64 feet in height, which will impound 225,000 acre-feet of water. With present plans of development of projects which this reservoir is intended to serve, the construction of a permanent dam at Lake Kachess will not be needed for two years.

In 1904 the Cascade Canal Company completed a small crib dam at the mouth of this lake for the purpose of storing water for irrigation, there being about 12,000 acres under its canal, of which 5,000 acres were being irrigated in 1906. A contract was entered into on December 12, 1906, by the terms of which the Cascade Canal Company is to pay to the United States the sum of $10,000 in five equal annual installments, the first falling due January 1, 1909, and the United States is to maintain storage works and to recognize in the Cascade Canal Company a perpetual right to 16,000 acre-feet of water to be delivered to said company from said storage works between July 20 and October 15 of each year, the company agreeing to limit its claim to 150 second-feet of water from the normal flow of Yakima River between March 15 and July 20 of each year.

This crib dam is about 10 feet in height, 200 feet long, and can impound about 8 vertical feet, or 32,000 acre-feet, of water. The Government assumed control of this dam on April 1, 1907.

LAKE CLEALUM.

This lake is situated on the headwaters of Clealum River, a tributary of Yakima River. It will be the largest of the reservoirs comprising the general storage system, its capacity for the final dam now contemplated being 426,000 acre-feet. As with the other lakes, construction of the permanent dam at Lake Clealum is not an immediate necessity, but to meet prospective requirements a temporary crib dam

is now under construction. The dam stores 18,000 acre-feet, and is of the same type as that described for Lake Keechelus. Its crest length is 200 feet, and it is provided with five 4 by 6 foot openings.

Construction was begun in September, 1906, and its history is similar to that of Keechelus crib dam, bids having been received and rejected simultaneously with those on that dam. A schedule of the first bids received is as follows:

Bids opened September 1, 1906, for construction of Clealum crib dam.

BIDDERS.

A. Robert Wakefield, Portland, Oreg., $32,550.
B. International Contracting Company, Seattle, Wash., $32,290.
C. Standard Construction Company, Portland, Oreg., $22,540.
D. C. E. Lum, North Yakima, Wash., $25,733.

ITEM 1.

Wet excavation, 1,500 cu. yds.:
Bidder A, $3 per cu. yd.
Bidder B, $3 per cu. yd.
Bidder C, $5 per cu. yd.
Bidder D, $3.50 per cu. yd.

ITEM 2.

Dry excavation, 5,000 cu. yds.:
Bidder A, $1 per cu. yd.
Bidder B, 90 cents per cu. yd.
Bidder C, 60 cents per cu. yd.
Bidder D, 48 cents per cu. yd.

ITEM 3.

Round logs, 37,000 lin. ft.:
Bidder A, 24 cents per lin. ft.
Bidder B, 25 cents per lin. ft.
Bidder C, 10 cents per lin. ft.
Bidder D, 12 cents per lin. ft.

ITEM 4.

Hewn timber, 78 M ft. B. M.:
Bidder A, $40 per M ft. B. M.
Bidder B, $40 per M ft. B. M.
Bidder C, $30 per M ft. B. M.
Bidder D, $26 per M ft. B. M.

ITEM 5.

Sawed lumber, 40 M ft. B. M.
Bidder A, $40 per M ft. B. M.
Bidder B, $45 per M ft. B. M.
Bidder C, $30 per M ft. B. M.
Bidder D, $28 per M ft. B. M.

ITEM 6.

Flashboards (180):
Bidder A, $1.50 each.
Bidder B, $1.50 each.
Bidder C, $1 each.
Bidder D, $1 each.

ITEM 7.

Riprap, 60 cu. yds.:
Bidder A, $9 per cu. yd.
Bidder B, $5 per cu. yd.
Bidder C, $2 per cu. yd.
Bidder D, $3.50 per cu. yd.

ITEM 8.

Rock fill, 4,500 cu. yds.:
Bidder A, $1.92 per cu. yd.
Bidder B, $1.90 per cu. yd.
Bidder C, $1 per cu. yd.
Bidder D, $2.25 per cu. yd.

EXPENDITURES.

Below is given a complete summary of expenditures on storage to end of fiscal year:

Net expenditures on storage to June 30, 1907.

Reservoir.	Administration.	Examination and surveys.	Rights of way.	Wagon roads.	Dam construction.	Dam maintenance.	Total.
Bumping Lake	$2,273.24	$2,199.86	.....	$22,664.32	.....	.....	$27,137.42
Lake Keechelus	3,593.50	1,612.04	$242.00	.....	$28,686.56	.....	34,134.10
Lake Kachess	840.72	2,815.90	75.00	.....	266.34	.....	3,997.96
Lake Clealum	4,140.31	3,981.41	8,720.95	.....	32,693.58	.....	49,536.25
Total	10,847.77	10,609.21	9,037.95	22,664.32	61,646.48	.....	114,805.73

TIMBER.

Surrounding lakes Clealum, Keechelus, Kachess, and Bumping Lake are good bodies of merchantable timber, which will be sub-

merged by the creation of reservoirs. This timber, which is chiefly fir, pine, and cedar, has been offered for sale to the public, and bids will be opened September 2, 1907. The schedule of timber offered is as follows:

Timber offered for sale around upper Yakima Lakes.

Lake.	Timber, feet B. M.	Railroad ties.	Telephone poles.
Bumping Lake	5,627,100	6,320	247
Lake Keechelus	28,136,700	1,180	730
Lake Kachess	10,119,620	3,802	374
Lake Clealum	19,908,375	7,168	704
Total	63,791,795	18,470	2,055

The same adverse conditions, namely, floods, severe winter weather, and the extreme difficulty of securing labor, which operated to delay work at Lake Keechelus, operated in like measure at Clealum, and it was finally decided, on February 1, 1907, to discontinue work until more favorable conditions prevailed. Work was resumed in July, 1907, and will be pushed to completion before winter. The small dam acquired in 1906 from the Union Gap Irrigation Company is no longer maintained, and such storage water as must be released to that company can be supplied from either Lakes Kachess or Keechelus.

YAKIMA DISTRICT ADMINISTRATION.

NORTH YAKIMA OFFICE.

Two lots at the corner of Fourth avenue and B street in the town of North Yakima were purchased for an office site. The lots have a combined frontage of 100 feet and are 140 feet deep and cost $1,600. Upon these lots there have been constructed a barn and wagon shed, a warehouse 30 by 60 feet and a two-story frame office building, with concrete basement and concrete vaults. The office building and warehouse were built by contract, the barn by force account. The following is an abstract of the bids received for constructing the warehouse:

Bids opened January 21, 1907, for construction of 30 by 60-foot warehouse at North Yakima.

G. S. Ellis	$1,045.00
Corbett & Raymond	1,095.00
C. H. Bruenn	1,200.00
Collins Bros	1,300.00
W. W. Felton	1,380.00
A. F. Switzer	1,498.50

Contract was awarded to G. S. Ellis, and work completed February 26, 1907, being one week earlier than the time specified.

Following is an abstract of the bids received for constructing the general office building:

Bids opened February 6, 1907, for construction of general office building, North Yakima, Wash.

Corbett & Raymond	$5,975
C. H. Bruenn	6,000
C. K. Wylie	7,850

All the above bids were rejected, and the work was readvertised, bids being opened February 15.

The following is an abstract of the bids opened February 15, 1907, for construction of the general office building:

Bids opened February 15, 1907, for construction of general office building, North Yakima, Wash.

C. H. Bruenn	$5,650
G. S. Ellis	5,745
Corbett & Raymond	5,850

Contract was awarded to G. S. Ellis, and work completed on June 1. The office building has been occupied since that date.

The net expenditures for general expenses of the Yakima district January 1 to June 30, 1907, are $17,281. These charges will be distributed to the projects affected.

STATE LEGISLATION.

The tenth session of the legislature of the State of Washington passed three bills directly bearing upon irrigation in this State.

The first, approved February 21, 1907, is as follows:

AN ACT Prohibiting the owners or those in charge of any canal or ditch from suffering noxious weeds or other growths to go to seed on the banks thereof, and providing a penalty for the violation thereof.

Be it enacted by the legislature of the State of Washington:

SECTION 1. If any person or persons, company or corporation, owning, maintaining, or operating any canal or ditch for irrigation, drainage, or power purposes shall permit or suffer any weed, weeds, or other noxious growths to grow upon the banks of such ditch or canal, and suffer the same to stand until the seeds thereof get ripe, such person or persons, company, or corporation shall be guilty of a misdemeanor and upon conviction thereof shall for the first offense be fined in the sum of ten dollars, and for the second and each subsequent offense not less than twenty-five nor more than one hundred dollars, to be recovered with costs in an action to be brought in the name of the State of Washington for the use and benefit of the public school fund of the State.

The second act, approved March 11, 1907, grants to persons or corporations the right to overflow State land by water impounded for public uses. The act is as follows:

AN ACT Providing for and giving and granting the right, privilege, and authority to perpetually back water upon, overflow, and inundate with water, lands belonging to the State of Washington, in the erection, construction, maintenance, or operation of water-power plants, reservoirs, or works for impounding water, for power purposes, irrigation, mining, or other public use.

Be it enacted by the legislature of the State of Washington:

SECTION 1. That there be, and is hereby, granted, by the State of Washington, the right, privilege, power, and authority, to any person or corporation to perpetually back and hold water upon and over any land belonging to the State of Washington, and to overflow any such land and inundate the same, if it be necessary in the erection, construction, maintenance, or operation of any water-power plant, reservoir, or works for impounding water for power purposes, irrigation, mining, or other public use.

SEC. 2. The right, privilege, power, and authority herein given and granted shall not be exercised or enjoyed until application shall first be made to the board of State land commissioners to have the amount of damages appraised and fixed, which shall be done within sixty days after such application is made.

SEC. 3. When and as soon as said damages are so fixed and assessed by the *board of State land* commissioners, the same shall be paid to said officer.

The third act, approved March 13, 1907, relates to the control, regulation, and distribution of stored waters, and was passed to aid the United States Reclamation Service, as well as private companies, in protecting water stored for beneficial uses. The act is as follows:

AN ACT Providing for the control, regulation, distribution, and measurement of stored waters and flowing waters; providing for the appointment of a commissioner and assistants for said purposes; fixing their compensation and tenure of office, and providing a penalty for violation of this act.

Be it enacted by the legislature of the State of Washington:

SECTION 1. That whenever the owner, manager, or lessee of a reservoir, constructed for the storage of water to be used for beneficial purposes, shall desire to use the bed of any stream or other natural water course for the purpose of carrying stored or impounded water from the reservoir to the user thereof, he shall, in writing, notify the superior court of any county within which said water is stored, carried, or used, giving the date when it is proposed to discharge water from such reservoir, and the names of all persons and ditches entitled to its use. The court may then, upon a proper showing as to the necessity therefor, appoint a commissioner with qualifications as hereinafter stated, whose duty it shall be to so close, regulate, or adjust the head gates of the several ditches taking water from such stream or natural water course that no more water will flow into said ditch than it is entitled to receive from the water stored in the reservoir or from the unregulated flow of the stream or from both, as determined by decrees of court or as shown by evidences of right properly recorded or by agreement between the parties in interest made with due regard to the legal rights of all, and any person who may be injured by the action of said commissioner, or by his failure to act as herein provided, may resort to any court of competent jurisdiction for such relief as he may be entitled to.

SEC. 2. Such commissioner shall possess such theoretical and practical knowledge of the science of hydraulics as will enable him to supervise the construction and operation of such measuring devices as may be necessary to place in any ditch, canal, or stream for the purpose of measurement of water. Said commissioner shall hold said office and discharge the duties thereof from the date of his qualification until the first day of the October following, but said commissioner may be removed or discharged at the pleasure of the superior court appointing him. Said commissioner shall be paid for his said services at the rate of not to exceed seven dollars per day for each day he shall be actually employed in the duties of his office, to be paid by the county in which the work is performed. Said commissioner shall keep a true and just account of the time spent by him in the duties of his office, and the time spent by him in the performance of his duties in each county, respectively, and shall present a true copy thereof, together with his bill for his said services, both verified by oath, to the board of county commissioners of the county in which the work may have been done. He shall render on the first day of each and every month to the superior court appointing him a report, verified by oath, detailing the duties performed by him as such commissioner during the preceding month. The said board of county commissioners shall, upon approval thereof by the superior court appointing said commissioner, allow the same and order a warrant drawn for the amount of said approved bill.

SEC. 3. Within ten days after his appointment and before entering upon the duties of his office, said commissioner shall take and subscribe the oath of office prescribed by the constitution of the State, and shall file a bond to the State of Washington with good and sufficient surety or sureties, to be approved by the superior court appointing said commissioner, in the sum of $1,000, for the faithful and impartial discharge of his duties.

SEC. 4. Said commissioner may, with the consent of the superior court appointing him, have power to employ and appoint assistants to aid him in the discharge of his duties whenever necessary. Such assistants shall take the same oath as the commissioner, and shall obey his instructions, and shall receive not to exceed five dollars per day for every day such assistant is so employed, to be paid in the manner provided for in section 2 hereof for the payment of the said commissioner.

SEC. 5. It shall be the duty of every appropriator entitled to the use of water of any stream or other natural water course along which stored and impounded

waters are being carried, to place and keep in repair in the ditch or canal through which the waters are diverted a substantial head gate, which shall be of such construction that it can be locked and kept closed by the commissioner; and such appropriator shall construct and maintain, when required by the commissioner, a flume or measuring device as near the head of such ditch as is practicable for the purpose of assisting the commissioner in determining the amount of water that may be diverted into said ditch from the stream. Neglect or refusal on the part of any person to place and keep in repair such head gate or measuring box, or, when locked by the commissioner or his authorized assistant for the measurement or apportionment of water, any interference with or disturbance of same, shall be a misdemeanor and shall be punishable by a fine not exceeding $100, nor less than $20, or by imprisonment not to exceed six months, or by both such fine and imprisonment, and the use of water through such device after having been interfered with, disturbed, or changed shall be *prima facie* evidence of the guilt of the person benefited by such interference, disturbance, or change.

SEC. 6. The Federal Government is hereby authorized to avail itself of all the provisions of this act.

LABOR AND MATERIALS.

The labor situation has been complex and discouraging. Unprecedented conditions all over the country, particularly in the West, and an unusual number of strikes of considerable magnitude, have caused wages to increase, and the demand for labor has been far in excess of the supply. The ruling wages for labor of all classes, except mining, are higher, it is believed, on the Pacific coast and in the Northwest than in any other part of the United States, and it is impossible to keep full-handed on any work undertaken. Under these conditions common labor has been transient and less efficient than in former years. Common labor is now (August, 1907) demanding and receiving from $2.50 to $3 per day, and in the harvest field $2.75 per day and board is common.

Market conditions have been unfavorable throughout the year as regards prices and deliveries.

CEMENT AND STEEL.

Contract was entered into on October 15, 1906, with the Pacific Portland Cement Company, of San Francisco, Cal., under specifications No. 109, for furnishing 27,000 barrels of cement, delivered f. o. b. cars, Tolenas, Cal., at $2 per barrel.

Contract was also entered into on January 26, 1907, with the Expanded Metal and Corrugated Bar Company, of St. Louis, Mo., under specifications No. 125, for furnishing 1,800,000 pounds of corrugated steel bars, at from $0.01875 to $0.02275 per pound, delivered f. o. b. cars at Pueblo, Colo.

The cement was required for Tieton and Sunnyside projects, and the steel for the Tieton alone. Each contract was supported by a bond in the sum of $7,500.

OPERATION AND MAINTENANCE.

WATER USERS' ASSOCIATIONS.

Tieton project.—The Tieton Water Users' Association was organized March 10, 1906, the capital stock consisting of 13,000 shares

of the par value of $60 each. By July 1, 1906, 33,000 acres of land had been subscribed to the association, much of which is considered non-irrigable by reason of character or location above the ditch. On July 14, 1906, at a meeting of the stockholders, the capital stock was increased to 24,000 shares of the par value of $60 each.

Sunnyside project.—The Sunnyside Water Users' Association was organized March 10, 1906, with a capital stock of 15,000 shares with the par value of $50 each. During the year 1906 to 1907, irrigable land within the Sunnyside project was subscribed to this association to the extent of approximately 20,000 acres. Steps have been taken, in compliance with the State law, to increase the capital stock of the association to 39,000 shares of the par value of $50 each.

TIETON PROJECT.

GENERAL STATEMENT.

The principal facts relating to the Tieton project are summarized below:

Summary of principal data relating to Tieton project.

State: Washington.
County: Yakima.
Townships: 12–15 north, ranges 15–19 east, Willamette meridian.
Latitude: 46° 30′.
Longitude: 120° 30′.
Railway connections: Northern Pacific Railroad, North Yakima and Valley Railroad, and the North Coast Railroad, now under construction.
Principal markets: Seattle, Tacoma, Spokane, and East.
Land office for district: North Yakima.
Average elevation: 1,200 to 2,100 feet.
Character of soil: Volcanic loam.
Range of temperature: Minimum, 0°; maximum, 108°.
Total area of irrigable lands: Public, 3,500 acres (largely entered); State and schools, 2,900 acres; railroad, 800 acres; other private, 16,800 acres; total, 24,000 acres.
Size of farm unit: 40 and 80 acres.
Value of irrigated lands: From $100 to $2,000 per acre.
Principal products: Forage, fruit, and hops.
Duty of water: Diversion duty, 1 second-foot to 80 to 100 acres.
Watershed area: 240 square miles above diversion dam.
Average annual discharge: 580,000 acre-feet.
Diversion dam: One concrete diversion dam on Tieton River, 3 feet high and 200 feet long.
Main canal: 12 miles long, circular concrete conduit 8 feet 2§ inches in diameter, flowing 5 feet 3 inches deep; capacity 300 second-feet.
Main laterals: 51 miles long.
Power: Can develop about 4,000 horsepower (gross).
Transmission lines: 7 miles, for construction purposes.

The Tieton project contemplates the irrigation of from 24,000 to 30,000 acres of land in the vicinity of North Yakima, Wash. Diversion will be by means of a low concrete dam in Tieton River, at a point about 14 miles above its junction with Naches River. The water will be conveyed in a reenforced concrete conduit along the precipitous side hill of the Tieton Canyon for a distance of 12 miles, 20 per cent of which distance will be in tunnel. The open canal sec-

tions will be of semi-circular form, 8 feet 2⅝ inches in diameter, with concrete shell 4 inches thick, while the tunnel sections will be of circular form, 6 feet 1½ inches in diameter, with concrete shell 4 inches thick. This canal and tunnel lining will be made up in 2-foot lengths, will be manufactured on the flats along the river bank, where concrete ingredients are readily obtainable, and will then be lifted to the canal line by cable hoist operated by electric power. These hoists will be used successively at points about 2 miles apart, and the concrete shapes will be transported along the canal between hoists on railroad track laid in the bed of the excavated canal.

The project was first investigated in 1905, a board of engineers rendering a report approving the project in October of that year. The history of the adjustment of the complex water-right situation in the Yakima Valley, an adjustment which was necessary before any construction could be begun, was fully reviewed in the fifth annual report, as was also the subsequent authorization of construction, December 12, 1905.

CANYON DIVISION.

After approval, plans were prepared for the main canal, or canyon division of the project, and these were considered by a board of engineers which convened in Portland, Oreg., during the first week in July. Two types of canal were considered; one, the semi-circular type, made of reenforced concrete shapes as already described, being alternate design A, the other a trapezoidal section, with concrete lining built in place, being alternate design B. The former was adopted by the board and specifications were immediately prepared on that basis. For bidding purposes the canal was divided into seven schedules, as follows:

Schedule 1, station 0 to 1+40, dam and headworks.
Schedule 2A, station 1+40 to 200, open canal excavation.
Schedule 3A, station 200 to 375, open canal and tunnel excavation.
Schedule 4A, station 375 to 545, open canal and tunnel excavation.
Schedule 5A, station 545 to 630, open canal and tunnel excavation.
Schedule 6A, manufacturing concrete shapes.
Schedule 7A, laying concrete shapes.

Bids were to have been opened on November 15, but owing to serious floods and washouts the actual opening was deferred until November 19, 1906. But one bid was received, and that for only schedules 5A, 6A, and 7A. An abstract of the bid follows:

Bid opened November 19, 1906, for construction of Schedules 5A, 6A, and 7A of Tieton main canal, Theodore Weisberger, North Yakima, Wash., being the only bidder.

[Specifications No. 116.]

SCHEDULE 5A, $91,774.

Excavation for open canal:
Class 1, 9,000 cubic yards: 24 cents per cubic yard.
Class 2, 100 cubic yards: 44 cents per cubic yard.
Class 3, 100 cubic yards: 65 cents per cubic yard.
Class 4, 6,000 cubic yards: 85 cents per cubic yard.

Excavation for tunnel:
Class A, 400 cubic yards: $3.80 per cubic yard.
Class B, 100 cubic yards: $7.80 per cubic yard.
Class C, 9,600 cubic yards: $8.50 per cubic yard.
Riprap, 50 cubic yards: 60 cents per cubic yard.
Rockfill, 50 cubic yards: 50 cents per cubic yard.
Tile drain, 900 linear feet: 30 cents per linear foot.
Dry filling in tunnel, 600 linear feet: 30 cents per linear foot.

SCHEDULE 6A, $136,800.

Concrete shapes for canal and tunnel lining and for flumes, 15,000 cubic yards: $9 per cubic yard.
Concrete shapes for flume supports, 200 cubic yards; $9 per cubic yard.

SCHEDULE 7A, $93,571.10.

Laying concrete shapes in open canal, 45,450 linear feet: $1.49 per linear foot.
Laying concrete shapes on flume supports, 1,155 linear feet: $1.25 per linear foot.
Erecting flume supports single story, 960 linear feet: $2.37 per linear foot.
Erecting flume supports double story, 150 linear feet: $3.07 per linear foot.
Erecting flume supports triple story, 45 linear feet: $4.21 per linear foot.
Laying concrete shapes in tunnel, 12,695 linear feet: $1.44 per linear foot.
Dry stone filling in tunnel, type A, 10,790 linear feet: 20 cents per linear foot.
Dry stone filling in tunnel, type B, 725 linear feet: 54 cents per linear foot.
Dry stone filling in tunnel, type C, 1,000 linear feet: 61 cents per linear foot.
Dry stone filling in tunnel, type D, 180 linear feet: 23 cents per linear foot.

The bid on schedule 5A was rejected, and contract made covering schedules 6A and 7A. There being no indication that immediate readvertising would secure additional bids, it was decided to build the main tunnels by force account.

The contractor for schedules 6A and 7A has been long delayed in getting his work started, due in large part to transportation and labor difficulties. He has established a plant for the manufacture of concrete shapes opposite station 80 of the canal, but the plant was not in operation at the close of the fiscal year A power canal 1,600 feet long has been constructed, and all machinery at the power house has been installed. This machinery consists of a 36-inch Morgan-Smith turbine operating under a 23-foot head; a 200-kilowatt, 10,000-volt electric generator running 450 revolutions per minute, and a step-down transformer to feed current to various motors at 220 volts.

The concreting plant consists of pump, rock crusher, sand and rock screens, and a No. 2 Chicago tube concrete mixer. One such plant has been installed and a second one is in process of installation. These concrete mixers have a capacity of 17 cubic feet batch and 30 batches per hour. The concrete is received from the mixer into steel cars mounted on trucks of 18-inch gauge, which are run out on a tramway to the casting yard. The forms or molds in which the concrete shapes are cast are made of steel. Each plant is designed for a capacity of 100 concrete shapes per day.

TUNNELS.

There are three main tunnels to be driven—namely, Trail Creek tunnel, about 3,000 feet long; Tieton Tunnel, about 3,000 feet long,

and North Fork tunnel, about 4,000 feet long. These tunnels are in a hard, black basalt formation, crosscut, however, apparently at frequent intervals, with rifts of loose, slide material that requires timbering.

The tunnel excavation will be a circular bore 7½ feet in diameter and will be driven by machine drills. The installation now provided is as follows:

Both portals, Trail Creek tunnel, 2 Adams electric drills.
Upper portal, Tieton tunnel, 2 Temple-Ingersoll electric air drills.
Lower portal, Tieton tunnel, 2 Wood air drills.
Both portals, North Fork tunnel, 2 wood air drills.

Tieton River has a fall of from 50 to 60 feet per mile, and advantage was taken of this to develop the power required for operating drills and other machinery, and for lighting purposes. The power installation consists of a power canal 3,500 feet long, of 180 second-feet maximum capacity, and 34 feet effective head; a Franklin air compresser capable of compressing 1,250 cubic feet of free air per minute to a pressure of 105 pounds per square inch, a Westinghouse generator of 120 kilowatts capacity, and one set of 26-inch Trump twin turbines. The plant was put in operation during the last week of June.

Bids for furnishing tunnel equipment were opened in North Yakima February 11, 1907, the total cost of equipment, as per contracts awarded, being $34,758. The successful bidders and principal items purchased were as follows:

Hallidie Machinery Company, Seattle, Wash.:
- One pair Trump 26-inch encased twin turbines, $2,218; weight, 36,000 pounds.

Salt Lake Hardware Company, Salt Lake, Utah:
- One Franklin air compresser, capacity 1,250 cubic feet per minute to 105 pounds per square inch, $2,546.78; weight, 27,000 pounds.
- One receiver, 42 inches by 10 feet, $100.04; weight, 1,850 pounds.
- One receiver, 36 inches by 8 feet, $110.57; weight, 1,965 pounds.
- One receiver, 48 inches by 12 feet, $141.97; weight, 2,900 pounds.
- Six 6-inch Champion exhaust fans, $290.29; weight, 4,500 pounds.
- One 10-horsepower double cylinder single drum air hoist, $301.25; weight, 2,350 pounds.
- One 5-horsepower Climax automatic engine, $84.15.
- Seven 3-inch wood air drills with 6 double screw columns, 4 tripods and weights, and complete set of repair parts, $1,662.97; weight, 6,000 pounds.
- One Numa drill sharpener and forge, $928.42; weight, 6,465 pounds.
- Four Adams electric drills, $3,831.70; weight, 10,425 pounds.
- Iron pipe and fittings, $2,736.44; weight, 117,369 pounds.
- 11,000 linear feet of 24-gauge galvanized ventilating duct, $1,980; weight, 44,000 pounds.
- 25,000 linear feet, 12-pound T rail, $2,055.50; weight, 106,500 pounds.
- Assorted drill steel, $257.40; weight, 4,000 pounds.
- One 120-kilowatt, 3-phase, 60-cycle, 2,300-volt Westinghouse generator, with 5-kilowatt exciter, $1,520.79.
- Bare copper wire (No. 4, B and S gauge), $3,545.68; weight, 13,000 pounds.

Caldwell Brothers Company, Seattle, Wash.:
- 2 Temple-Ingersoll electric air drills (No. 4-C), $2,255; weight, 4,500 pounds.

Pending the preparation of specifications for purchase of above equipment effort was made to let by contract the opening up of approaches to all long tunnels and the driving of columnar tunnel,

1,200 feet long, and Log Slide tunnel, 1,000 feet long, bids being opened on January 19, 1907. No bids were received for excavating approaches. An abstract of the proposals received for driving the columnar tunnel is as follows:

Bids opened January 19, 1907, for driving columnar tunnel, Tieton project, Washington.

BIDDERS.

A: Olaf Olsen, Seattle, Wash., $26,382.50.
B: C. E. Lum, North Yakima, Wash., $22,950.

ITEM 1.

Open excavation, class 1, 50 cu. yds.:
Bidder A, 40 cents per cu. yd.
Bidder B, 50 cents per cu. yd.

ITEM 2.

Open excavation, class 2, 350 cu. yds.:
Bidder A, 70 cents per cu. yd.
Bidder B, $1 per cu. yd.

ITEM 3.

Open excavation, class 3, 400 cu. yds.:
Bidder A, 90 cents per cu. yd.
Bidder B, $1.50 per cu. yd.

ITEM 4.

Open excavation, class 4, 350 cu. yds.:
Bidder A, $1.85 per cu. yd.
Bidder B, $1.50 per cu. yd.

ITEM 5.

Tunnel excavation, class A, 40 cu. yds.:
Bidder A, $9 per cu. yd.
Bidder B, $11 per cu. yd.

ITEM 6.

Tunnel excavation, class B, 40 cu. yds.:
Bidder A, $11 per cu. yd.
Bidder B, 11 per cu. yd.

ITEM 7.

Tunnel excavation, class C, 1,870 cu. yds.:
Bidder A, $13 per cu. yd.
Bidder B, $11 per cu. yd.

All bids on this work were rejected.

On the same date bids for driving the log slide tunnel were opened. Only one bid was received, and the following is an abstract of the same:

Bid of Olaf Olsen, Seattle, Wash., ($25,905.00), being the only bid received January 19, 1907, for driving log slide tunnel, Tieton project, Washington.

Open excavation:
Class 1, 7,000 cu. yds.: 45 cents per cu. yd.
Class 2, 900 cu. yds.: 75 cents per cu. yd.
Class 3, 900 cu. yds.: 95 cents per cu. yd.
Class 4, 800 cu. yds.: $1.90 per cu. yd.

Tunnel excavation:
Class A, 20 cu. yds.: $9 per cu. yd.
Class B, 20 cu. yds.: $11 per cu. yd.
Class C, 1,485 cu. yds.: $13 per cu. yd.

Another effort was made to let the open canal work and small tunnels by contract by dividing the work into small schedules. Bids were opened May 1, 1907. There were but three bidders, two of whom bid on small portions of the work, and one, the Puget Sound Bridge and

Dredging Company, bid on all the work. The unit prices bid were as follows:

Bids opened May 1, 1907, for constructing part of Tieton main canal.

BIDDERS.

A. Olaf Olsen, Seattle, Wash. (schedules 28 and 37).
B. Horace Allison, Mabton, Wash. (schedule 29).
C. Puget Sound Bridge and Dredging Company, Seattle, Wash. (schedules 1 to 38, inclusive).

ITEM 1.

Open canal excavation, class 1:
Bidder A, 35 cents per cu. yd.
Bidder B, 80 cents per cu. yd.
Bidder C, 73 cents per cu. yd.

ITEM 2.

Open canal excavation, class 2:
Bidder A, 50 cents per cu. yd.
Bidder B, $2 per cu. yd.
Bidder C, 90 cents per cu. yd.

ITEM 3.

Open canal excavation, class 3:
Bidder A, $1.10 per cu. yd.
Bidder B, $2.50 per cu. yd.
Bidder C, $1.27 per cu. yd.

ITEM 4.

Open canal excavation, class 4:
Bidder A, $1.60 per cu. yd.
Bidder B, $3.50 per cu. yd.
Bidder C, $2.25 per cu. yd.

ITEM 5.

Tunnel excavation, type A:
Bidder A, $16.50 per lin. ft.
Bidder C, $24.85 per lin. ft.

ITEM 6.

Tunnel excavation, type B:
Bidder A, $17 per lin. ft.
Bidder C, $24.85 per lin. ft.

ITEM 7.

Tunnel excavation, type C:
Bidder A, $17 per lin. ft.
Bidder C, $24.85 per lin. ft.

ITEM 8.

Tunnel excavation, type D:
Bidder C, $24.85 per lin. ft.

All bids were rejected.

The work was readvertised, proposals to be opened May 13, 1907, and the following is an abstract of the one bid received, which covered the construction of the columnar tunnel only:

Bid opened May 13, 1907, for construction of columnar tunnel, A. G. Moodhe, Spokane, Wash., being the only bidder.

[Total amount of bid, $18,217.]

Open canal excavation:
Class 1, 100 cubic yards; 30 cents per cubic yard.
Class 2, 20 cubic yards; 75 cents per cubic yard.
Class 3, 20 cubic yards; $1.10 per cubic yard.
Class 4, 900 cubic yards; $1.50 per cubic yard.
Tunnel excavation:
Type A, 1,000 linear feet; $14 per linear foot.
Type B, 100 linear feet; $14 per linear foot.
Type C, 100 linear feet; $14 per linear foot.

The above bid was accepted, and contract entered into on May 17, 1907. This contract was approved at the close of the fiscal year, and the contractor has begun to excavate the tunnel approaches; he is now arranging to install compressor plant to operate his drills.

No further effort was made to secure contract work, and camps were immediately established by the Government and a force of about four hundred men installed to prosecute the work.

The canal work completed July 1 was as follows:

Open canal excavation:		
Class 1	cubic yards	25,644
Class 2	do	9,770
Class 3	do	7,920
Class 4	do	15,720
Tunnel excavation:		
Trail Creek tunnel	linear feet	4
Tieton tunnel	do	79
North Fork tunnel	do	13
Culverts:		
Rubble masonry	cubic yards	198
Dry rubble walls	do	29
Rock fill	do	37

POWER PLANT.

The power plant is located about 11 miles below the head of canal, at a point just opposite the adit between the Tieton and North Fork tunnels. The installation, which consists of compressor and generator, belt-driven by turbine water wheel, has already been described. About 500 horsepower of energy is developed, which is ample to operate the six electric drills, six air drills, shop machinery, pumps, hoists, etc., and to light all the camp buildings. The Trump turbine is regulated by a Woodward governor, and the power canal is provided with an ample automatic overflow, just below the power house. An electric transmission line, carrying 2,300 volts, has been constructed to the upper portal of Trail Creek tunnel, a distance of 7 miles. Adams electric drills are being operated at the two portals of Trail Creek tunnel, and Temple-Ingersoll electric air drills at the upper portal of Tieton tunnel. At all these portals transformers have been installed to step voltage down from 2,300 to 220. At the lower portal of Tieton tunnel, and at both portals of North Fork tunnel, Wood air drills have been installed. For convenience of delivering materials to Tieton and North Fork tunnels a tramway has been constructed from the shops up the mountain side which is of 18 inch gauge, 12-pound rail, is 1,600 feet long, rises 500 feet, and is operated by cable and 10-horsepower air hoist.

Machinery for power plant and tunnel equipment in general was long delayed in shipment, and its installation was not completed until the close of the fiscal year.

HEADWORKS.

The diversion dam is to be a low, concrete structure, 200 feet long, its crest being 3 feet above the river bed. It will be founded on coarse river gravel and bowlders, and will be provided on its downstream side with a shallow crib apron covered with heavy planking. The bulkheads will permit an overflow depth on crest of about 10 feet.

The headworks proper will be of concrete, with three 4 by 5 foot cast-iron gates, having an aggregate capacity at low water in winter of 300 cubic feet per second. The construction of the headworks will be deferred until 1908.

TELEPHONE LINE.

A metallic circuit telephone line has been constructed from the general office in North Yakima to Camp 1 (main camp) in Tieton Can-

yon, and from there a single-wire line to all the upper camps and headworks. A single-wire line has also been constructed from Camp 4 to the county road at the junction of Tieton and Naches rivers, this line being regarded as part of the Bumping Lake telephone line, which will be constructed at some future date. A short temporary line has also been constructed along the Naches road to Naches City, giving connection with the warehouse at that point. This latter line is constructed on the poles of the Naches Telephone Company, with which company a contract has been made for rental of poles at 5 cents per pole per annum. A similar contract has been made with the Cowichee Telephone Company for use of its poles from the city limits of North Yakima to Camp 4, a distance of 21 miles. Within the town of North Yakima service is covered by contract with the Pacific Telephone and Telegraph Company. A private exchange, controlling all its lines, is maintained by the Reclamation Service at its North Yakima office. In Tieton Canyon telephones have been established at all important camps and at the portals of all long tunnels. The total length of lines now operated, which were nearly completed at end of fiscal year, is as follows:

Telephone lines.

	Length, miles.
North Yakima to Camp 1, metallic circuit	22
Camp 1 to headworks, ground return	11
Bumping Lake line, ground return	2½
Naches City line, ground return	4
Total	39½

CULVERTS.

There are numerous ravines and draws along the main canal, drainage from which must be carried across the canal. Concrete flumes had been designed for these places, but the rock excavation from the main canal made it economical to construct rubble masonry culverts and rock-fill embankments, thereby eliminating all flumes.

These culverts vary in width from 2 to 8 feet, and are of segmental or full centered arch type. The culvert masonry proper is laid in Portland cement mortar, but the spandrel walls are hand-laid dry

WASTEWAYS.

One wasteway will be constructed at Trail Creek in Tieton Canyon, and another where the canal emerges through the last tunnel into Cowiche Valley. This latter will be at the head of the irrigable lands and will afford quick relief in event of washouts below. This wasteway discharges into the north fork of Cowiche Creek.

VALLEY DIVISION.

Plans and specifications for the Valley division, which embraces the entire distribution system, are to be completed. This work is now in progress, and it is proposed to call for bids during the winter of 1907, and commence actual construction in 1908.

EXPENDITURES.

The expenditures on the Tieton project are as indicated in the tabulation below:

Expenditures according to features on Tieton project to June 30, 1907.

Canyon Division:	
General expense, including engineering and administration	$25,041.64
Mess inventories	1,682.44
Corrals	88.20
Camp construction, including equipment	8,791.36
Camp maintenance	1,607.99
Power plant construction	20,452.55
Power plant operation	13.17
Blacksmith shop, operation	574.50
Transmission line, 7 miles	6,234.89
Telephone line, 33 miles	2,959.77
Wagon roads, construction, renewals, and repairs	26,991.21
Patrol houses	1,237.44
Real estate and rights of way	1,385.69
Tramway at Camp 1	530.75
Pipe lines	1,025.99
Open canal excavation, 59,054 cubic yards	39,106.63
Materials for concrete shapes (schedule 6A)	21,133.16
Masonry culverts	679.25
Trail Creek tunnel, 4 linear feet	70.92
Tieton tunnel, 79 linear feet	1,654.57
North Fork tunnel, 13 linear feet	167.96
Valley Division:	
General expense, including engineering and administration	15,588.51
Total	177,018.59

Total expenditures, according to purpose and nature, on Yakima-Tieton project to June 30, 1907.

[Total, $177,018.59.]

	Services.	Traveling.	Subsistence.	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination	$3,601.20	$831.03	$465.99	$72.26	.....	$226.98	$1.75	$70.23	$74.47
Survey	10,812.55	788.83	2,099.05	610.34	$22.50	1,143.09	40.98	676.57	.....
Design	3,487.45	209.20	6.16	3.97	.....	39.70	11.44	1.76	107.08
Subdivision	734.99	90.34	73.67	3.92	.....	10.84	.52	51.37	.....
Building:									
Rights and property	816.13	248.30	30.87	14.69	951.00	72.59	.....	.....	.....
Building	54,579.54	583.12	14,450.00	13,990.94	31,328.83	16,442.47	16.96	3,068.23	297.86
Administration	9,976.75	1,059.22	162.70	844.74	36.00	1,226.92	382.09	68.31	.....

SUNNYSIDE PROJECT.

GENERAL STATEMENT.

The principal facts relating to the Sunnyside project are summarized below:

Summary of principal data relating to Sunnyside project.

State: Washington.
Counties: Yakima and Benton.
Latitude: 46° 20′.
Longitude: 120°.

Railway connections: Northern Pacific Railroad, and the North Coast Railroad, under construction.
Principal markets: Seattle, Tacoma, Spokane, and East.
Land office for district: North Yakima.
Average elevation: 700 feet.
Character of soil: Deep light volcanic loam.
Range of temperature: 0° to 110°.
Average rainfall: 7 inches.
Total area of irrigable lands: Public, 3,500 acres (largely entered); State and school, 2,100 acres; railroad, 5,000 acres; other private, 80,000 acres.
Watershed area: 3,300 square miles.
Average annual discharge: 3,500,000 acre-feet.
Diversion dam: 1 concrete diversion dam 7 feet high, 500 feet long.
Main canal: Length, 63 miles; capacity at head, 1,070 second-feet.
Main laterals: Length, 210 miles; variable capacity.
Power developed: 1,500 gross horsepower can be developed.
Pumping stations: At least 3 large stations and several small stations could be installed.

This project contemplates the ultimate irrigation of about 90,000 acres of land, including 40,000 acres now irrigated from the canal formerly owned by the Washington Irrigation Company. The property was purchased from the last-named company for $250,000, of which $240,000 has been paid and $10,000 is retained for guarantee of perfection of rights of way. Water is obtained by diversion from Yakima River at a point about 8 miles below North Yakima, where new concrete headworks have been completed and a new concrete diversion dam is now in process of construction. This canal is entitled to 650 second-feet from the low-water flow of Yakima River, and storage is therefore relied upon to supply the deficiency to make up final requirements of the enlarged canal. This storage is to be obtained in the upper Yakima lakes and at Bumping Lake, where large reservoirs will ultimately be constructed.

The land under the project, all, or nearly all of which will ultimately be irrigated, is as follows:

	Acres.
Now owning water right and irrigated	40,000
Now owning water right and not irrigated	8,000
Snipes Mountain lateral, pumping plant	4,000
Snipes Mountain pumping plant	2,000
Rocky Ford pumping plant	1,000
Individual pumping plant	1,000
Under main canal, not owning water right	20,000
Under extension of main canal	4,000
Under Mabton & Prosser lands on south side of river	10,000
Total	90,000

A general discussion of the preliminary work appeared in the Fifth Annual Report.

The construction of the project was authorized on December 12, 1905.

For convenience of administration two departments have been organized for the project, namely, (*a*) the Construction department, in charge of a construction engineer, which has the handling of all new work and the general development of the project; and (*b*) the Operating department, in charge of an irrigation manager, which has the handling of matters relating to operation and maintenance. The departments are independent, and each reports to the Yakima district engineer.

DRAINAGE.

When the Sunnyside Canal was constructed, 15 years ago, no provision for drainage was considered, nor did this appear to be necessary at the time. During the past eight years, however, the water plane has risen 25 feet, and drainage now becomes a problem that must be considered. Snipes Mountain, which skirts the southern edge of the project, prevents ready egress of seepage and waste water from the canal into Yakima River, and forces these waters around its eastern and western extremities. At the east end of Snipes Mountain is situated the town of Sunnyside, the center of an area of 10,000 acres requiring drainage, and at the west end, near the town of Granger, an area of 5,000 acres requires drainage.

Drainage districts, under provision of State law, have been organized by the water users, and about $40,000 has already been expended. While some good has been accomplished, the construction work has generally been of an inferior quality, and the systems as a whole can not be regarded as a success. The drainage feature of this project must be dealt with, and it remains to be determined whether it be handled by the community under the provisions of the State acts of 1895 and 1901, or by the Reclamation Service.

WASTEWAYS.

As a protection to the main canal, three wasteways have been considered, as follows:

Wasteways for main canal, Sunnyside project.

Name.	Length.	Capacity.
	Miles.	*Second feet.*
Zillah wasteway	½	1,030
Sulphur Creek wasteway	8	450
Prosser wasteway	2	60

The first mentioned of these is now under construction, and will be completed as soon as the close of the irrigation season will permit the construction of the headworks. These will be of concrete, as will also the upper 1,600 feet of wasteway conduit, the lower end being a wooden flume. The wasteway flow will be controlled by four 4 by 5 feet cast-iron gates operated by a small turbine. The wasteway discharges into Yakima River.

SUNNYSIDE DAM.

The construction of a weir to replace the old movable dam, which had done service since the canal was built, was begun in the fall of 1906. The old dam consisted of a series of iron brackets spaced 6 feet on centers, against which flashboards were placed to a height of 6 feet. These brackets were hinged at their base, the anchorage being concrete founded on a poor quality of bed rock, and were alternately lowered and raised at the close and opening of the irrigation season.

Serious leaks developed under and through the dam, and this, combined with the annual expense and danger of handling brackets and flashboards, made removal necessary.

The new dam is of solid concrete, of the overflow-weir type, and is about 8 feet high by 500 feet long. The bulkheads at either end rise 13 feet above the crest of the weir, and are designed to pass a flood of 75,000 second-feet. The dam will be carried down, for nearly its entire length, to firm bed rock, the surface rock being removed generally to a depth of from 2 to 3 feet, except for curtain walls, where the excavation is carried deeper. At the east or right shore end of dam no bed rock was encountered, and dam is founded partly on coarse river gravel, this being immediately adjacent to and under the bulkhead, and the next 50 feet on an indurated greenish clay. At the west end of dam a fish ladder has been provided.

Work was begun in October, 1906, and was carried on through a portion of the winter, then discontinued on account of labor and weather conditions, and resumed again in July, 1907. In November, 1906, violent floods stopped all work, washed out a portion of the cofferdams, and otherwise caused delay and damage. Again in February, high water released immense ice gorges that had been formed in the river earlier in the season. These carried away a portion of the cofferdams and compelled a stoppage of the work. Work will be resumed early in July, 1907.

HEADWORKS.

These are of substantial concrete construction, with cast-iron gates operated by ball-bearing, screw-stem lifting device. There are six gates, each 6 by 6 feet square, having a total capacity of 1,080 second-feet. The construction of headworks was carried on simultaneously with the construction of the dam, and except installation of gates, which were delayed long in shipment, was practically completed at the opening of the irrigation season. The head gates are located on the left bank of river. The head house, a rubble masonry structure, which terminates the weir, serves as its right bulkhead. In addition to the cast-iron gate control, front and rear flashboards have been provided, so that any gate may be pocketed for repairs, and there has also been provided a set of wooden Taintor gates to permit quick cut-off of flow in case of emergency.

Bids for cast-iron gate guides were opened October 22, 1906, and were as follows:

Bids opened October 22, 1906, for furnishing six sets of cast-iron gate guides for Sunnyside headworks.

[Weight, 6,000 pounds; delivery, f. o. b. cars Parker, Wash.]

Vulcan Iron Works, Chicago, Ill., $447.
Abner Doble Company, San Francisco, Cal., $450.
Olympic Foundry Company, Seattle, Wash., $570.
Phoenix Iron Works, Portland, Oreg., $576.
United Iron Works, Oakland, Cal., $642.
North Yakima Machine Shop, North Yakima, $954.
Vulcan Iron Works, Seattle, Wash., $960.

Contract was awarded to the Vulcan Iron Works, Chicago, Ill.

Bids for cast iron gates for Sunnyside headworks were opened November 28, 1906, and were as follows:

Bids opened November 28, 1906, for furnishing six cast-iron gates for Sunnyside headworks.

[Dimensions, 6 by 6 feet; weight, 14,400 pounds.]

The Moran Company, Seattle, Wash., $504.
Vulcan Iron Works, Chicago, Ill., $554.64.
Olympic Foundry Company, Seattle, Wash., $862.50.
Phoenix Iron Works, Portland, Oreg., $1,032.
United Iron Works, Oakland, Cal., $1,110.
Llewellyn Iron Works, Los Angeles, Cal., $1,740.

Contract was awarded to The Moran Company, Seattle, Wash.

Manufacturers were requested to submit their own standard make of operating mechanism, the result being a great variation in type and price.

Contract was awarded to the Chapman Valve Company, Indian Orchard, Mass., for six sets of ball-bearing operating mechanism with tobin-bronze screw stems, at $206 per set.

PUMPING PLANTS.

This project affords several pumping-plant opportunities, as indicated in a foregoing table. The aggregate of these main plants is about 7,000 acres, but there is also considerable demand for lease of power from small drops, also for the privilege of installing individual steam or gasoline plants to pump above the main canal, where the lands are largely adapted to fruit culture. The important question in relation to these larger pumping units is whether the Reclamation Service will install them or will require the water users to install them as with the small individual plants; also in the former case how the cost of installation will be apportioned to the lands affected.

OLD WATER-RIGHT LANDS.

With the purchase of the Sunnyside canal from the Washington Irrigation Company came the responsibility and duty of serving the 48,000 acres of land to which water rights attached, 40,000 acres of which were under irrigation. The water-right contracts, which the Government must respect, provide, with few exceptions, for a maintenance tax of $1 per annum for individual maintenance of laterals and for a delivery of one second-foot of water (continuous flow) to 160 acres of land. New landowners desiring a water right are required to join the Water Users' Association and to conform to various requirements as to farm unit, residence, etc., provided in the stock-subscription contract. As the new lands are entitled to as much water as may be required for their crops, and as the old lands are limited to a flow of one second-foot to 160 acres, it seemed desirable, in order to secure uniformity of operation, that the owners of the old lands join the Water Users' Association and merge their old water right into a new water right. This would entitle the old lands to a sufficiency of water and would facilitate operation, give the old

water-right owners a proprietary interest in the canal and tend to reduce their maintenance cost.

The old water-right owners were accordingly invited to join the Water Users' Association on the basis of payment of one-fifth the construction charges to new lands. This they generally declined to do, basing their objection chiefly on the farm unit and residence restriction imposed on owners of new land. Having already developed the country and brought their lands under cultivation, they contended for the retention of 160 acres and the removal of all residence restrictions. This demand was granted and a special form of contract was prepared whereby the water user is to be furnished all the water his land may require for irrigation and is permitted to hold 160 acres of land; he in turn agrees to join the Water Users' Association and to pay to the United States $10 per acre, which payment may be made in from one to five installments, as the water user may elect.

OPERATION AND MAINTENANCE.

Although the canal property was formally surrendered to the Reclamation Service on July 26, 1906, its actual operation was continued under the supervision of the Washington Irrigation Company until December 1, 1906, when a final accounting was had. Since that date the Reclamation Service has had complete charge of the property. The actual area of land under cultivation is not known definitely, in fact it varies from season to season, but an approximate estimate is 40,000 acres. It is purposed to determine this area more closely by actual survey when time permits. The lands entitled to receive water are far in excess of those actually irrigated, and consist of several classes as to character of right and the maintenance tax they are required to pay, as follows:

Lands under existing Sunnyside canal.

Description.	Annual maintenance charge.	Area.	Number of contracts.	Average acreage per contract.
		Acres.		
Old water-right lands, fixed maintenance	$1.00	36,852	1,459	25.3
Do	.50	1,378	62	22.2
Old water-right lands, proportional maintenance	.50	169	12	14.1
Old water-right lands still retained by Washington Irrigation Co., fixed maintenance	1.00	4,500	.....	.....
Konnewock lands, no maintenance	.....	3,000	.....	.....
Rental lands	2.50	3,220	142	22.7
Total	.....	49,119	1,677	24.8

Old water-right lands.—These are lands which owned a water right at the time the canal was purchased from the Washington Irrigation Company, and by the terms of the purchase all receipts from maintenance tax for the 1906 irrigation season would accrue to the Government, and all expenditures subsequent to December 1, 1905, would be borne by the Government.

Konnewock lands.—Under an existing contract, the Washington Irrigation Company was obligated to deliver to these lands, free of maintenance charge, 30 second-feet of water during the irrigation season, which contract has been assumed by the United States. Deliveries are made at numerous headings, but the distribution system is maintained and operated by the Konnewock Ditch Company.

Rental lands.—When the Sunnyside canal was acquired by the Government it was found that certain lands had been permitted to rent water instead of purchasing a water right, and under this arrangement a small area had been seeded and planted to orchard. To protect these investments, and pending the time when a Government water right could be purchased, this rental plan was continued. Contracts were accordingly prepared which required water renters to subscribe to the stock of the Water Users' Association, and imposed a rental fee of $2.50 per acre per annum. The renter was also required to pay the cost of installation of a measuring box, which was approximately $12 per box.

Receipts.—The total receipts from maintenance and water rentals since the acquisition of the property to the close of the fiscal year were as follows:

Receipts from operation of Sunnyside canal to July 1, 1907.

Maintenance fees collected by Washington Irrigation Company prior to final accounting	$27,693.30
Maintenance fees collected by United States Reclamation Service since final accounting	36,286.47
Water rentals	8,429.59
	72,409.36

Service.—Water deliveries have been made continuously since the opening of the irrigation season, April 1, 1907, there having been no break or mishap of any kind. The canal had been put in excellent operating condition during the winter, extra repair gangs having been put on for this purpose. The cost of this work was greater than in previous years, due to unusually severe winter weather and the difficulty of securing labor. In November the flood in Yakima River threatened the old wooden head gates and the embankment immediately below, necessitating night and day patrol for a period of nearly two weeks. Following this was heavy snow and unprecedented cold weather. On February 8 came a chinook wind, which melted the snows on the Rattlesnake Hills. A torrent of water poured into the canal, overflowing its banks and causing several washouts in the vicinity of Sunnyside, the repairs of which cost about $4,000. Little available time remained before the irrigation season opened, but extra forces were employed and the repair work was completed in time.

Organization.—The regular operating organization is made up as follows:

An irrigation manager, with headquarters at Zillah, who has general control of the property.

A chief clerk and a stenographer in manager's office.

An assistant engineer, whose duty it is to make all surveys, such as locations of laterals, establishment of measuring boxes, etc.

A hydrographer, whose duty it is to install gauges, establish rating curves for same, and, in general, to determine the volumetric distribution of the water.

A water superintendent, who has immediate charge of distribution, canal repairs, etc., and to whom the patrolmen report.

Ten patrolmen, whose duty it is to patrol daily their respective beats and make water deliveries as scheduled.

After the close of the irrigation season an extra force of men and teams are engaged for general repairs of the canal, and the patrolmen are temporarily detached from patrol duty and utilized on this work.

Duty of water.—The actual delivery duty of water on the Sunnyside canal has never been carefully determined, other than an occasional observation on a specific crop. Cippoletti weirs have been established at nearly all delivery points, but a system for securing continuous and reliable records of flow over these weirs has not yet been perfected. The installation of a new telephone system and a new form of record for patrolmen will facilitate this study. It is also proposed to establish, at the ends of all patrol beats, gauges, which will be read and reported daily. With measurements of all diversions this will make possible a determination of seepage and other losses to any point of the canal. A gauge has been regularly maintained at the head of the canal, and some idea of diversion duty may be obtained from the indications of this gauge.

Diversion at intake for 40,000 acres, Sunnyside canal.

Month.	Average daily flow, second-feet.	Acre-feet.	Acre-feet per acre.
1907.			
April	237.15	14,036	0.352
May	508.40	31,205	.780
June	598.00	29,581	.739
Total	.....	74,822	1.871

To express it differently, the above indicates that for the first three months of the irrigation season the average diversion was 1 second-foot to 89.3 acres.

Telephone line.—The old telephone line, heretofore used for operating purposes, being neither a wholly independent nor a serviceable line, was taken down and a new line constructed. The new system is located along the right of way of the main canal, with one branch extending to the patrol house near Sunnyside, on Snipes Mountain lateral, and another branch extending to the patrol house on Rocky Ford lateral. It is a metallic circuit line (No. 12 galvanized wire), about 60 miles in length, strung on substantial cedar poles, 25 and 40 feet in length. The construction throughout is high grade and the service obtained is unexcelled. The old telephone line was utilized to the extent of contributing 28 miles of wire to the new con-

struction. Fifteen telephone instruments were installed on the line. The cost of telephone line was as follows:

Cost of Sunnyside telephone line.

Item.	Unit.	Unit cost.	Amount.
Material:			
65 miles of single No. 12 galvanized wire (old wire not included)	Mile	$7.58	$492.52
2,059 cedar poles, 25 feet long	Pole	1.35	2,779.65
70 cedar poles, 40 feet long	do	2.50	175.00
15 Stromberg-Carlson telephone sets	1 set	14.50	217.50
900 galvanized-iron anchor rods	C	28.00	252.00
2,500 glass insulators	M	27.00	67.50
3,500 brackets	M	13.50	47.25
22,000 linear feet $\frac{1}{4}$-inch 7-strand galvanized cable	C feet	1.22	268.40
1,600 metal clips	Each	.18	288.00
Miscellaneous supplies			193.91
Total material, 60 miles	Mile	79.70	4,781.73
Labor:			
Distributing 2,129 poles (average haul, 8 miles)	Pole	.29	616.35
Setting 2,129 poles	do	1.02	2,179.25
Stringing wire and anchor, 60 miles metallic circuit	Mile	19.16	1,149.45
Total labor, 60 miles	do	65.75	3,945.05
Grand total for 60 miles	do	145.45	8,726.78

Patrol houses.—Houses are provided for patrolmen, and are maintained in good condition. An extra patrol house was erected at Zillah during the fiscal year for the accommodation of the chief clerk, there being no houses available in the town. This condition may compel the construction of additional cottages for accommodation of employees, when enlargement of main canal is begun.

Disbursements.—A detailed statement of maintenance cost, December 1, 1906, to July 1, 1907, including all betterments and additions which may be regarded as part of the operating system, is given below. The betterments, as already discussed, consist of telephone line, patrol house at Zillah, new measuring boxes, etc. The amounts given are exclusive of any credits which may have passed to the various items by reason of maintenance charges collected and of freight charges, which latter have not yet been received.

Disbursements for maintenance and operation, Sunnyside canal, December 1, 1906, to July 1, 1907.

General expense:	
Salaries, clerical force, and manager	$3,020.00
Salaries, engineering force	1,232.33
Telephone	19.50
Stationery and printing	3.00
Traveling	188.00
Office, heat, light, janitor, etc	161.18
Drafting	131.61
Labor, headquarters building, Zillah	191,40
Material, headquarters building, Zillah	140.40
	5,087.42
Telephone line:	
Exclusive of charges prior to December 1, 1906	6,313.11

Intake:	
Labor, repairing dam	$336.50
Salary, watchman	70.67
Material, repairing dam	375.15
	782.32
Main canal:	
Salaries, patrolmen and superintendent	1,241.83
Labor, patrol houses, construction	365.25
Labor, patrol houses, repairs	50.40
Labor, earthwork, ordinary repairs	6,350.80
Labor, earthwork, extraordinary repairs	3,530.08
Labor, timberwork, new construction	624.25
Labor, timberwork, repairs	486.75
Materials, patrol houses, construction	495.25
Materials, patrol houses, repairs	75.45
Materials, wood work, new construction	524.40
Materials, wood work, repairs	472.04
	14,216.50
Laterals:	
Salaries, patrolmen and superintendent	1,447.50
Labor, patrol houses, repairs	45.00
Labor, earthwork, ordinary repairs	1,792.90
Labor, earthwork, extraordinary repairs	750.00
Labor, wood work, new construction	286.50
Labor, wood work, repairs	138.50
Labor, measuring boxes, weirs, etc	2,309.41
Materials, repairs, patrol houses	25.50
Materials, woodwork, new construction	518.30
Materials, woodwork, repairs	408.12
Materials, measuring boxes, weirs, etc	850.75
	8,572.48
Barn:	
Labor	379.17
Feed, hay, grain, etc	586.75
Shoeing	126.50
Repairs to harness	58.25
Repairs to wagons and vehicles	97.15
Repairs to fences, labor and materials	27.75
	1,275.57
Camp No. 1:	
Labor, cooks	170.00
Supplies, foodstuffs	235.40
Supplies, meats	206.50
Supplies, miscellaneous	114.25
Fuel	42.60
	768.75
Equipment:	
Main canal	118.00
Laterals	48.00
Wagons and vehicles	100.00
Camp No. 1	25.00
	291.00
Grand total	37,307.15

The net expenditures to June 30, 1907, on Sunnyside project are as follows:

Expenditures according to features, Sunnyside project, to June 30, 1907.

Construction:	
General expense	$25,848.37
Diversion dam and headworks	24,868.40
Zillah wasteway	4,114.55
Sulphur Creek wasteway	464.93
Real estate	229,001.16
Corral inventory	58.07
Operation:	
General expense	3,611.06
Intake	622.42
Main canal	10,055.40
Laterals	7,522.92
Corral No. 1	1,537.19
Total	307,704.47

Total expenditures, according to purpose and nature, on Sunnyside project to June 30, 1907.

[Total, $307,704.47.]

	Services.	Traveling.	Subsistence.	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination	$5,123.00	$858.98	$382.84	$92.67	$20.00	$265.23	$35.00	$129.40	$185.54
Survey	8,224.26	639.60	1,502.97	528.74	25.25	649.16	3.83	689.78	.....
Design	1,003.90	117.01	.49	6.73	.....	25.91	21.30	.....	1.32
Subdivision	371.21	57.61	73.67	3.93	.....	12.65	.27	51.38	.....
Building:									
Rights and property	833.67	402.18	30.88	13.68	202,345.58	3,092.08	.....	135.00	.....
Building	22,911.61	173.87	5,113.46	4,598.25	7,505.87	2,958.98	88.84	31.20	506.86
Maintenance	16,834.21	15.00	430.67	149.82	2,762.52	1,195.94	.....	75.90	.....
Administration	10,596.59	1,065.30	119.35	766.25	60.80	1,310.24	403.41	72.83	.....

WAPATO PROJECT.

The principal facts relating to the Wapato project are summarized below:

Summary of principal data relating to Wapato project.

State: Washington.
County: Yakima.
Township: 10, 11, and 12 north, ranges 17, 18, 19, 20, and 21 east, Willamette meridian.
Latitude: 46° 20′.
Longitude: 120° 20′.
Railway connections: Northern Pacific Railroad, and North Coast Railroad, under construction.
Average elevation: 700 feet.
Character of soil: Volcanic loam.
Average rainfall: 7 inches.
Range of temperature: 0° to 110°.
Total area: 20,000 acres, all Indian lands, and mostly allotted.
Size of farm unit: Not fixed, probably 40 acres.
Value of irrigated lands: At present $50 to $200.

Principal products: Forage, fruit, hops, melons.
Duty of water: 1 second-foot to 120 acres.
Watershed area: 3,300 square miles above diversion dam.
Average annual discharge: 3,500,000 acre-feet.
Storage reservoirs. (See detailed discussion of storage.)
Diversion dam: Concrete weir, 7 feet high, 500 feet long.
Main canal: 52 miles.
Main laterals: 68 miles.

The Wapato project contemplates the irrigation of 120,000 acres on the Yakima Indian Reservation along the right bank of the Yakima River. A detailed statement of the early investigations of this project and plans for development will be found on page 289 of the Fifth Annual Report.

There are at present about 17,000 acres of land under irrigation from ditches, taking water from the main river, constructed in large part by the Indian Bureau. These ditches it is proposed to absorb in the larger system, and due credit for same will pass to the Indian Bureau, as provided by the Federal act of March 7, 1906. It was stated in the last annual report that it would be difficult to secure the consent of all Indians to the sale of a portion of their individual allotments, as many of them were minor heirs for whom guardians would have had to be appointed by the local courts, which would have entailed much delay and annoyance. This difficulty has now been at least partly obviated by an act of Congress, passed March 1, 1907, which authorizes the Secretary of the Interior to name such guardian and permits him to appoint a single guardian for all. During the fiscal year detailed surveys were made, and these confirmed the original conclusions that the project was feasible and economic. It developed that drainage would be an important feature of the project, there being a total of some 40,000 acres likely to be affected by ground water.

The project will require about 200,000 acre-feet of storage, which it is proposed to secure in the upper Yakima lakes. A tentative allotment of $100,000 for the project was made on June 16, 1906. A special report and estimate was rendered in December, 1906, since which date no further action has been taken.

Total expenditures, according to purpose and nature, on Yakima-Wapato project to June 30, 1907.

[Total, $4,154.66.]

	Services.	Traveling.	Subsistence.	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination	$1,512.68	$99.10	$26.12	$15.29	.....	$59.60	.....	$120.98	$78.57
Survey	1,218.69	42.68	80.83	40.30	.....	55.67	.....	112.99	.....
Design	11.66	.78	.....	.....	.....	.05	$0.18	.....	.11
Subdivision	.52	.39	.....	.....	.....	.07	.....	.....	.....
Building:									
Rights and property	4.00	.98	.....	1.87	$48.00	.60	.....	.....	.....
Building	2.01	.48	.....	.....	.....	.14	.13	.....	.....
Administration	430.49	51.79	6.75	42.53	.....	67.82	17.81	2.00	.....

KITTITAS PROJECT.

GENERAL STATEMENT.

The principal facts relating to the proposed Kittitas project are summarized below:

Summary of principal data, proposed Kittitas project.

State: Washington.
County: Kittitas.
Townships: Townships 16, 17, 18, and 19 north, ranges 17, 18, 19, and 20 east, Willamette meridian.
Latitude: 47°.
Longitude: 120° 30′.
Railway connections: Northern Pacific Railroad and Chicago, Milwaukee and St. Paul Railroad, under construction.
Principal markets: Seattle, Tacoma, Spokane, Wash.
Land office for district: North Yakima, Wash.
Average elevation: 1,600 feet.
Character of soil: Volcanic loam.
Range of temperature: 0° to 100°.
Average rainfall: 10 inches.
Total area of irrigable lands: Public, 9,500 acres (4,200 acres entered); State, 6,200 acres; railroad and other private, 45,000 acres.
Size of farm unit: Not fixed; probably 80 acres.
Value of irrigated lands: $75 to $400 per acre.
Principal products: Forage and fruit.
Duty of water: 1 second-foot to 80 acres (diversion).
Watershed area: Above diversion point, 145 square miles.
Average annual discharge: 500,000 acre-feet.
Storage reservoirs: Kachess and Keechelus. (See Storage.)
Diversion dam: Masonry weir, 20 feet high, 180 feet long.
Main canal: 90 miles.
Main lateral: 24 miles.

The Kittitas project has for its object the irrigation of 60,000 acres of land in Kittitas County, Wash. It is, as all other reclamation projects in the Yakima Valley, dependent on storage, which will be obtained in Lakes Clealum, Kachess, and Keechelus. Several favorable diversion points exist, three of these being on Clealum River, and one on Yakima River near Easton. A short discussion of the preliminary studies of this project will be found on page 290 of the Fifth Annual Report. Other than a continuation of hydrographic work, no work has been done on the project, nor is it likely that anything looking toward actual construction can be done for some time.

The net expenditures to June 30, 1907, are $6,741.91.

BENTON PROJECT.

The principal facts relating to the Benton project are summarized below:

Summary of principal data, Benton project.

State: Washington.
Counties: Benton and Yakima.
Townships: Townships 9 to 13 north, ranges 25 to 28 east, Willamette meridian.

Latitude: 46° 25′.
Longitude: 119° 30′.
Railway connections: Northern Pacific Railroad and North Coast Railroad, under construction.
Principal markets: Seattle, Portland, Spokane, and East.
Land offices for district: North Yakima and Walla Walla.
Average elevation: 500 feet.
Character of soil: Volcanic, sandy loam.
Range of temperature: 20° to 110°.
Average rainfall: 7 inches.
Total area irrigable lands: Public, 67,000 acres (15,000 entered); State, 18,000 acres; railroad, 88,000 acres; other private, 7,000 acres.
Size of farm unit: Not fixed, probably 40 acres.
Value of irrigated lands: $100 to $1,000 per acre.
Principal products: Forage, fruit, berries, and vegetables.
Duty of water: 1 second-foot to 130 acres (on the land).
Watershed area above diversion: 5,050 square miles.
Diversion dam: Concrete weir.
Main canal: 31 miles.
Main laterals: 163 miles.
Power developed: 11,000 gross horsepower.
Pumping stations: 1 plant, turbine, 11,000 horsepower capacity (gross).

The Benton project as originally planned contemplated the irrigation of 210,000 acres of land in Benton County, Wash. This land lies along the west bank of Columbia River, 180,000 acres of which lie north and 30,000 acres south of Yakima River, this latter area being reached by siphon. Since the preliminary studies of this project were made the Hanford Power and Irrigation Company has started construction on a project which proposes to develop power at Priest Rapids on Columbia River and to pump water for irrigation to about 30,000 acres along the west bank of the river. This construction is now well under way, and the indication is that water will be delivered to some of the land in 1909. The 180,000 acres above referred to will therefore be reduced to 150,000 acres.

The proposed point of diversion for the Benton project is in the vicinity of Prosser, on Yakima River. Two diversion sites have been considered, one immediately at Prosser, the other at a point 1 mile below. Sufficient investigations have not yet been made to determine which of these sites is the better, but the original estimate was based on the assumption that the upper site would be used. This will require a concrete masonry overflow dam about 25 feet high and 1,000 feet long. Other than a continuation of discharge measurements on Yakima River, nothing has been done on this project during the fiscal year.

The expenditures to June 30, 1907, are $11,167.45.

PALOUSE PROJECT.

A brief description of this project may be found on page 345 of the Fourth Annual Report. The net expenditures to June 30, 1907, are $76,144.14.

PRIEST RAPIDS PROJECT.

This project is described on pages 597–599 of the Third Annual Report. The net expenditures to June 30, 1907, are $6,452.81.

WYOMING.

SHOSHONE PROJECT.

GENERAL STATEMENT.

The main features of the Shoshone project are summarized below:

Summary of principal data relating to Shoshone project.

County: Bighorn.
Latitude: 44° 30′.
Longitude: 108°.
Average elevation: 4,500 feet.
Railway connections: Toluca-Cody branch of Chicago, Burlington and Quincy Railroad runs through the area.
Principal markets: Local.
Irrigable area: Extends from Cody to Frannie, Wyo.; public, 123,000 acres; State and school, 7,680 acres; other private, 1,220 acres.
Range of temperature: Maximum, 95°; minimum, —20° F.
Average rainfall: 6 to 10 inches.
Size of farm units: 40 and 80 acres.
Value of irrigated land: $25 to $75 per acre.
Principal products: Hay and grain.
Duty of water: Depth of 2½ to 3 feet on the land.
Character of soil: Light sandy and clay loams.
Watershed area: 1,380 square miles.
Average annual discharge: 1,000,000 acre-feet.
Storage reservoir: Area, 6,600 acres; capacity, 456,000 acre-feet.
Storage dam: Type, concrete arch; height, 310 feet above foundation; length, top 200 feet; bottom, 85 feet.
Diversion dam: Type, concrete gravity; height, 18 feet; length, 400 feet.
Main canals: Length, 60 miles; width, 20 to 40 feet.
Lateral canals: Length, 150 miles.
Per cent public lands: 98.

HISTORY OF EXAMINATION.

Examination of the Shoshone project began in May, 1903, and continued until November of that year. This examination consisted of topographic surveys of the irrigable lands and surveys to determine the feasibility of storing water above the Shoshone Canyon, where there is a good reservoir site. On December 29, 1903, the matter of the relinquishment of the land segregated by the State under the provisions of the Carey Act was taken up by correspondence with Governor Chatterton of Wyoming, and later all rights of the State to the lands were relinquished by the State land board to the Secretary of the Interior.

In February, 1904, preliminary plans, based on the examination of 1903, were passed upon by a board of engineers and on February 10, 1904, the Secretary of the Interior authorized the construction of the project; "Provided that satisfactory rights to land and water be secured, and provided that further consideration of details on the ground by consulting engineers results in favorable reports."

On February 13, 1904, Col. W. F. Cody, the survivor of Cody & Salisbury, transferred to the Secretary of the Interior their right to appropriate the water of Shoshone River for the reclamation of the land segregated by the State. The relinquishment of the land by the State and the transfer of the water right by Col. W. F. Cody secured to the United States all rights pertaining to the land and water.

The Shoshone project will provide water for the reclamation of from 125,000 to 150,000 acres of land along Shoshone River in Bighorn County, Wyo. The land ultimately to be reclaimed by this project lies on both sides of Shoshone River. The lands on the north side extend in a northeasterly direction from Cody to Frannie, a distance of 40 miles, have an average width of from 4 to 5 miles, and have an area of about 120,000 acres. The lands on the south side of the river lie south of the town of Garland and have an area of from 25,000 to 30,000 acres.

When finally completed the project will consist of Shoshone dam, in the canyon of the Shoshone River between Cedar and Rattlesnake mountains, 8 miles west of Cody; Corbett dam, across the Shoshone River, 8 miles east of Cody; Corbett tunnel, 3¼ miles in length, into which water for 80,000 acres of land will be diverted by the Corbett dam; Garland canal, extending from the lower end of Corbett tunnel to near Ralston, a distance of 8 miles; Willwood diversion dam, in Shoshone River 6 miles below Corbett dam, for diverting water into a conduit—type not yet determined—for the reclamation of the lands on the south side of the Shoshone River; a high line consisting of a series of tunnels and canals through Shoshone Canyon, and 25 miles of main canal extending from the mouth of the canyon to Eaglenest Creek. In connection with the above features there will be a complete system of lateral canals and distributing ditches.

Preliminary work necessary on this project included the erection of office buildings, lodging houses, mess houses, warehouses, the construction of a road 4 miles in length through Shoshone Canyon, and the installation of a telephone system. The road and telephone system will not cease to be of value after the project is completed, as the road will be used as a portion of the road to the Yellowstone National Park, replacing a portion of the road now in use which will be covered by the Shoshone reservoir, and the telephone line will be a necessary adjunct to the proper operation of the irrgation works.

In the following table are listed the contracts entered into for building work on the Shoshone project. This list includes all contracts for excavation, embankment, masonry, and the erection of structures, but does not include materials such as cement, steel, timber, etc.

Contracts for building work on Shoshone project to June 30, 1907.

No. of contract.	Contractor.	Feature.	Estimated total value.	Payments to June 30, 1907.	Per cent paid.
67	Prendergast & Clarkson [a]	Shoshone dam	$515,730.00	$46,250.88	9
68	Charles Spear [b]	Corbett tunnel	594,325.09	66,026.03	11
130	United States Fidelity and Guaranty Co. [c]	Shoshone dam	469,479.12	15,736.37	3
139	Billings Construction Co.	Corbett dam	66,750.00	47,906.75	72
144	Nels L. Olson	Division 1, Garland canal	270,746.60	150,614.53	56
156	W. D. Lovell	Structures, division 1, Garland canal.	50,544.50	5,500.54	10
148	Jesse W. Crosby, jr	Settling basin embankment.	23,740.50	18,548.40	82
150	New Jersey Foundry and Machine Co.	High-pressure gates	55,500.00	.....	.....
158	Emanuel Thomas	Division 16, Garland canal	5,629.00	1,297.93	23
160	Johnson Bros	Divisions 9–15, 17, and 19, Garland canal.	79,080.00	20,180.18	25
168	R. M. Lynn	Division 3, Garland canal	26,950.00	2,052.02	9
169	McGuffey & Blood	Divisions 2 and 4, Garland canal.	61,784.00	18,066.18	28

[a] Contractor in default; work carried on by United States Fidelity and Guaranty Co.
[b] Contractor in default; work carried on by force account.
[c] Supplemental contract.

SHOSHONE DAM.[a]

The location selected for Shoshone dam is a gorge in solid granite about 70 feet wide at the bottom of the river channel and about 200 feet wide at an elevation of 250 feet above the river channel; these conditions seemed to call for a type of dam other than a gravity section. After careful consideration of the problem by a board of engineers, an arch dam, the radius of the center of the top being 150 feet, was decided upon. The cross section adopted has the following dimensions: Height, 310 feet; width at the top, 10 feet; the batter of the upstream face from the top of the dam to the stream bed (245 feet), 15 per cent; the batter of the downstream face, same vertical distance, 25 per cent. From the stream bed to the foundation (60 feet) both faces are vertical; the width of the bottom section of the dam is 108 feet.

The dam will be constructed of concrete in which pieces of granite rock weighing from 25 to 200 pounds will be placed and distributed uniformly throughout the dam, forming at least 25 per cent of its volume. The dam will impound 456,000 acre-feet of water and will control the entire flow of the Shoshone River, amounting to an annual run-off of 1,000,000 acre-feet. During the construction of the dam the normal flow of the river will be diverted through the outlet tunnel.

On September 18, 1905, the contract for the building of the dam was awarded Prendergast & Clarkson, of Chicago, for $515,730. These contractors, before their default in August, 1906, completed the temporary diverting dam, the excavation of the outlet tunnel, the lining for about one-half of the tunnel, and about 800 feet of flume extending downstream from the diverting dam. They did also some excavating on the spillway and abutments of the dam and in the roadway tunnel. The portion of the flume built was destroyed by high water June 13, 1906.

[a] See Fourth Annual Report, Plates LXI–LXII.

Since the default of Prendergast & Clarkson, in August, 1906, the work has been carried on under a supplemental contract by the United States Fidelity and Guaranty Company of Baltimore, sureties on the bond of Prendergast & Clarkson. Most of the work carried on during the year ended June 30, 1907, by these contractors was preliminary to actual construction. The principal features of this work were the replacing of the flume destroyed by the flood of 1906 by a very substantial flume, which successfully withstood the flood of 1907, the completion of the lining of the outlet tunnel, the completion of the roadway tunnel, some excavation on the spillway and abutments of the dam, and the installation of additional plant.

The maximum flood in the river for the season of 1907, occurred during the early morning of July 4, causing the failure of a log boom owned by a lumber company and located about 2 miles above the dam site. As a result several hundred saw-logs passed over the temporary dam, destroyed its apron, and damaged it to such an extent that about 100 feet of it went out at noon of July 5. It is thought that this damage will not delay the work materially, since it should be repaired in a short time.

CORBETT DAM.[a]

Corbett dam is located across Shoshone River, 8 miles below Cody. It is a reenforced concrete structure containing about 6,000 cubic yards of concrete and about 300,000 pounds of steel reenforcement; it is 400 feet in length on the crest, and has a maximum height of 18 feet. The purpose of this dam is to divert water into Corbett tunnel. The dam and the headworks of Corbett tunnel are being built as one structure.

On August 6, 1906, the contract for building Corbett dam was awarded the Billings Construction Company, of Billings, Mont., for $66,750. The contractor began operations about one month after the award of the contract, and carried on the work continuously until June, 1907, when operations had to be suspended on account of high water, leaving about 25 per cent of the work uncompleted. The contractor has completed both of the abutments of the dam, the tunnel portal, and the earthen embankment, beginning at the south end of the dam and extending therefrom a distance of 450 feet. The portion of the dam not completed is a section about 160 feet in length near its middle.

CORBETT TUNNEL.[b]

The Corbett tunnel is designed to carry 1,000 second-feet of water from Corbett dam to the head of Garland canal, a distance of 3¼ miles. The tunnel is located parallel with the general direction of the left bank of Shoshone River to allow for the excavation of three short adits from the river bluff to the tunnel. Work of excavation was carried on at the six headings provided by these adits, from the two portal headings, and from two headings provided by a shaft 75

[a] See Fifth Annual Report, Plates XCVIII–XCIX.
[b] See Fourth Annual Report, Plates LVIII, LIX, LX.

feet in depth, making a total of ten headings, the greatest distance between headings being 5,751 feet.

On September 16, 1905, the contract for excavating Corbett tunnel was awarded Charles Spear, of Billings, Mont., for $594,325. The contractor began work on the excavation of the adits in November, 1905, and on the excavation of the tunnel in January, 1906. The contractor carried on the work at a very slow rate of progress until August, 1906, when he defaulted, having excavated in the meantime 5,129 linear feet of tunnel and placed 962 linear feet of concrete lining of arch and sides.

On August 17, 1906, the work was taken over by the United States. When work was resumed, an examination showed that the effect of air and water had been very serious in portions of the tunnel and that it was not safe for workmen to enter the greater portion of it. In places large amounts of rock had broken from the roof and sides of the tunnel, and in other places the timbering was badly distorted and settled, rendering the placing of concrete lining impossible. Other portions of the tunnel were entirely caved in, blocking the entire tunnel section. In places where the temporary timbering remained in place the material was found to be cracked and shattered above it. In order to place the tunnel in a safe condition it was found necessary to do a large amount of retimbering.

Since August 17, 1906, the work of excavating the tunnel has been carried on by force account, no special difficulties being encountered after the tunnel was placed in a safe condition. Considerable additions to the plant taken over were found necessary from time to time as the work progressed. The average force employed has been from 500 to 600, great difficulty being experienced in obtaining men. On June 30, 1907, the excavation of the tunnel was practically completed, there remaining on that date only 1,210 linear feet of bench. Since August 17, 1906, 10,748 linear feet of concrete lining of sides and arch were completed and 3,620 linear feet of concrete floor. The material excavated throughout the tunnel consisted of dry clay, loose shales, and stratified sandstones of different degrees of hardness. On exposure to the air the material disintegrated rapidly. Water in small quantities was encountered in various parts of the tunnel.

SETTLING BASIN.[a]

The Corbett tunnel will discharge into a settling basin at its lower end formed by a dam built across a narrow ravine and provided with a spillway. The building of the dam and spillway was included in the contract made with Charles Spear for Corbett tunnel. Upon his default an informal proposal for completing the dam and spillway was received from Jesse W. Crosby, jr., of Lovell, Wyo., who had a subcontract under Charles Spear for this work. This proposal was accepted, and on December 8, 1906, a contract was made with him for its completion. On June 30, 1907, the dam and spillway were practically completed.

[a] See Fifth Annual Report, Plate C.

The following is an abstract of the informal proposal of Jesse W. Crosby, jr., for the completion of the settling-basin dam and spillway:

Informal proposal received from Jesse W. Crosby, jr., for completion of settling-basin dam and spillway.

[Total amount of bid, $23,740.50.]

Open-cut excavation, 24,000 cubic yards: 39½ cents per cubic yard.
Dry-rock paving in place, 300 cubic yards: $2 per cubic yard.
Gravel filling under rock paving, 100 cubic yards: $1 per cubic yard.
Rock excavation in side slope, 3,100 cubic yards: $1.50 per cubic yard.
Placing material in embankment, 25,100 cubic yards: 35½ cents per cubic yard.

GARLAND CANAL, DIVISION 1.

The part of the main canal heading at the settling basin and extending to near Ralston, a distance of 7½ miles, where the first lateral leaves it, is designated Division 1. The building of this division involves some heavy rock excavation near its head and the building of a high embankment, which carries the canal across a deep ravine. Bids for this division having been rejected May 24, 1906, upon formal readvertisement bids were opened July 11, 1906, at Billings, Mont. Four bids were received, the lowest being that of Nels L. Olson, of Butte, Mont. The contract was awarded him November 2, 1906. Progress on this contract has been slow. Only 62 per cent of the work was completed, although 80 per cent of the contract time had elapsed on June 30. Following is an abstract of bids received:

Bids opened July 11, 1906, at Billings, Mont., for Division 1, Garland canal, Shoshone project, Wyoming.

BIDDERS.

A. Jesse W. Crosby, jr., Cowley, Wyo.; schedule 2, section 4, $37,022; schedule 5, section 7, $29,800.
C. Nels L. Olsen, Butte, Mont.; schedule 7, $270,746.60 (entire work or none).
C. Billings Construction Co., Billings, Mont.; schedule 1, section 2, $125,661; schedule 2, section 3, $58,618.60; schedule 3, section 4, $32,407; schedule 4, section 6, $29,671; schedule 5, section 7, $24,980; schedule 6, section 8, $31,617. Must be awarded schedules 1 and 2, or will accept none. If awarded 1 and 2 will also accept one or more of schedules 3, 4, 5, and 6.
D. W. C. Bradbury, Denver, Colo.; schedule 7, $275,065.

SCHEDULE 1, SECTION 2, STATIONS 183-240, BIDDER C.[a]

Grading, class 1, 138,000 cubic yards: 28 cents per cubic yard.
Grading, class 2, 14,000 cubic yards: 60 cents per cubic yard.
Grading, class 3, 62,000 cubic yards: $1.25 per cubic yard.
Overhaul, 6,000 cubic yards; 1½ cents per cubic yard.
Rolling embankments, 6,000 cubic yards: 1 cent per cubic yard.
Water for puddling, 250,000 gallons; 60 cents per 1,000 gallons.
Concrete, 50 cubic yards: $20 per cubic yard.
Rubble masonry, 550 cubic yards: $3.50 per cubic yard.
Riprap, 100 cubic yards: $3.50 per cubic yard.
Gravel foundation, 20 cubic yards: $1 per cubic yard.

[a] Only bidder.

Laying 30-inch pipe, 130 linear feet: $2 per linear foot.
Wire fabric, 260 pounds: 10 cents per pound.

SCHEDULE 2, SECTION 3, STATION 287 + 97.9, BIDDER C.*

Grading, class 1, 117,000 cubic yards; 26 cents per cubic yard.
Grading, class 2, 100 cubic yards; 60 cents per cubic yard.
Grading, class 3, 8,000 cubic yards; $1.25 per cubic yard.
Overhaul, 176,000 cubic yards; 1½ cents per cubic yard per 100 feet.
Rolling embankment, 52,000 cubic yards; 1 cent per cubic yard.
Water for puddling, 2,400,000 gallons; 60 cents per thousand gallons.
Concrete, 710 cubic yards; $17 per cubic yard.
Riprap, 40 cubic yards; $3.50 per cubic yard.
Gravel foundation, 200 cubic yards; $1 per cubic yard.
Laying 12-inch pipe, 100 linear feet; $1 per linear foot.
Wire fabric, 320 pounds; 10 cents per pound.
Steel for reenforcement, 16,610 pounds; 6 cents per pound.

SCHEDULE 3, SECTION 4, STATION 287 + 97.9, STATION 397.

Grading, class 1, 104,000 cubic yards: Bidder A, 30 cents; Bidder C, 24 cents per cubic yard.
Grading, class 2, 100 cubic yards: Bidder A, $1; Bidder C, 60 cents per cubic yard.
Grading, class 3, 100 cubic yards: Bidder A, $1.50; Bidder C, $1.25 per cubic yard.
Overhaul, 19,000 cubic yards: Bidder A, 1½ cents; Bidder C, 1½ cents per cubic yard.
Rolling embankment, 100 cubic yards: Bidder A, 1 cent; Bidder C, 1 cent per cubic yard.
Concrete, 285 cubic yards: Bidder A, $10; Bidder C, $15 per cubic yard.
Riprap, 140 cubic yards: Bidder A, $4; Bidder C, $3.50 per cubic yard.
Gravel foundation, 130 cubic yards: Bidder A, $4; Bidder C, $3.50 per cubic yard.
Laying 30-inch pipe, 800 linear feet: Bidder A, $1.50; Bidder C, $2 per linear foot.
Wire fabric, 1,560 pounds: Bidder A, 10 cents; Bidder C, 10 cents per pound.

SCHEDULE 4, SECTION 6, STATION 406–443 + 14.1, BIDDER C.*

Grading, class 1, 58,000 cubic yards; 25 cents per cubic yard.
Grading, class 2, 100 cubic yards; 60 cents per cubic yard.
Grading, class 3, 11,000 cubic yards; $1.25 per cubic yard.
Rolling embankments, 13,000 cubic yards; 1 cent per cubic yard.
Concrete, 50 cubic yards; $15 per cubic yard.
Riprap, 50 cubic yards; $3.50 per cubic yard.
Gravel foundation, 20 cubic yards; $1 per cubic yard.
Laying 30-inch pipe, 130 linear feet; $2 per linear foot.
Wire fabric, 260 pounds; 10 cents per pound.

SCHEDULE 5, SECTION 7, STATION 443 + 14 TO STATION 500.

Grading, class 1, 95,000 cubic yards: Bidder A, 30 cents; Bidder C, 25 cents per cubic yard.
Grading, class 2: Bidder A, $1; Bidder C, 60 cents per cubic yard.
Grading, class 3, 500 cubic yards: Bidder A, $1.50; Bidder C, $1.25 per cubic yard.
Overhaul, 14,000 cubic yards: Bidder A, 1½ cents; Bidder C, 1½ cents per cubic yard per 100 feet.
Rolling embankments, 10,000 cubic yards: Bidder A, 1 cent; Bidder C, 1 cent per cubic yard.
Concrete, 10 cubic yards: Bidder A, $10; Bidder C, $20 per cubic yard.
Riprap, 10 cubic yards: Bidder A, $4; Bidder C, $3.50 per cubic yard.

* Only bidder.

SCHEDULE 6, SECTION 8, STATION 500—STATION 586. BIDDER C.[a]

Grading, class 1, 85,000 cubic yards: 26 cents per cubic yard.
Grading, class 2, 100 cubic yards: 60 cents per cubic yard.
Grading, class 3, 100 cubic yards: $1.25 per cubic yard.
Overhaul, 33,000 cubic yards: 1½ cents per cubic yard per 100 feet.
Rolling embankments, 20,000 cubic yards: 1 cent per cubic yard.
Water for puddling, 1,000,000 gallons: 60 cents per thousand gallons.
Concrete, 155 cubic yards: $15 per cubic yard.
Riprap, 1,200 cubic yards: $3.50 per cubic yard.
Gravel foundation, 60 cubic yards: $1 per cubic yard.
Steel for reenforcement, 5,800 pounds: 6 cents per pound.
Placing structural-steel gates and fittings, 18,000 pounds: 6 cents per pound.
Lumber, 500 feet B. M.: $40 per M feet B. M.
Wire fabric, 40 pounds; 10 cents per pound.

SCHEDULE 7, 7 MILES OF CANAL, STATION 183 TO STATION 586, EXCEPT STATIONS 327 TO 330 AND STATIONS 397–406.

Grading, class 1, 597,000 cubic yards: Bidder B, 23 cents; Bidder D, 24 cents per cubic yard.
Grading, class 2, 14,500 cubic yards: Bidder B, 60 cents; Bidder D, 75 cents per cubic yard.
Grading, class 3, 81,700 cubic yards: Bidder B, $1.15; Bidder D, $1.05 per cubic yard.
Overhaul, 248,000 cubic yards: Bidder B, 1½ cents; Bidder D, 1½ cents per cubic yard per 100 feet.
Rolling embankments, 101,100 cubic yards: Bidder B, 1 cent; Bidder D, 1 cent. per cubic yard.
Water for puddling, 3,650,000 gallons: Bidder B, 60 cents; Bidder D, 60 cents per thousand gallons.
Concrete, 1,260 cubic yards: Bidder B, $10; Bidder D, $12 per cubic yard.
Rubble masonry, 550 cubic yards: Bidder B, $3; Bidder D, $9 per cubic yard.
Riprap, 1,540 cubic yards: Bidder B, $3; Bidder D, $2.50 per cubic yard.
Gravel foundation, 430 cubic yards: Bidder B, 90 cents; Bidder D, $1 per cubic yard.
Laying 12-inch pipe, 100 linear feet: Bidder B, $1.50; Bidder D, 70 cents per linear foot.
Laying 30-inch pipe, 1,060 linear feet: Bidder B, $2; Bidder D, $1.70 per linear foot.
Wire fabric, 2,440 pounds: Bidder B, 10 cents; Bidder D, 10 cents per pound.
Steel for reenforcement, 22,410 pounds: Bidder B, 6 cents; Bidder D, 5 cents per pound.
Placing structural steel, gates and fittings, 18,000 pounds: Bidder B, 4 cents; Bidder D, 3 cents per pound.
Lumber, 500 feet B. M.: Bidder B, $50; Bidder D, $50 per M feet B. M.

STRUCTURES, GARLAND CANAL, DIVISION 1.[a]

These structures are of reenforced concrete and consist of the headworks, a culvert under the Chicago, Burlington and Quincy Railroad, Eagle Nest crossing and waste way, and the controlling works at the outlet of Ralston reservoir. Bids for building these structures were opened at Billings, Mont., on August 23, 1906. Only one bid was received, that of the Billings Hardware Company, and as this bid was deemed excessive it was rejected and the work was authorized to be done by force account. The following is an abstract of the bids opened

[a] Only bidder. [b] See Fifth Annual Report, Plate CL.

August 23, 1906, for construction of the structures on division 1 of Garland Canal:

Bid of Billings Hardware Company, Billings, Mont., only bid received; opened August 23, 1906, for construction of structures on Garland Canal, division 1, Shoshone project, Wyoming; bid on all schedules or none.

[Specifications No. 106.]

Schedule 1, headgates, $6,030:
Grading, class 1, 50 cubic yards; $1.25 per cubic yard.
Grading, class 2, 50 cubic yards; $2.25 per cubic yard.
Grading, class 3, 50 cubic yards; $5.50 per cubic yard.
Puddling, 200 cubic yards; $1.50 per cubic yard.
Concrete, 200 cubic yards; $17.50 per cubic yard.
Placing steel in reenforced concrete, 14,000 pounds; 5 cents per pound.
Erecting metal work, 18,000 pounds; 6 cents per pound.
Schedule 2, culvert work under Burlington and Missouri River Railroad, $7,772.50:
Grading, class 1, 4,500 cubic yards; 45 cents per cubic yard.
Grading, class 2, 50 cubic yards; $2.25 per cubic yard.
Grading, class 3, 20 cubic yards; $5.50 per cubic yard.
Puddling, 100 cubic yards; $1.50 per cubic yard.
Paving, 150 cubic yards; $5.50 per cubic yard.
Concrete, 200 cubic yards; $17.50 per cubic yard.
Placing steel in reenforced concrete, 21,000 pounds; 5 cents per pound.
Schedule 3, Eagle Nest Creek crossing, $34,143.50:
Grading, class 1, 12,500 cubic yards; 40 cents per cubic yard.
Grading, class 2, 100 cubic yards; $2.25 per cubic yard.
Grading, class 3, 100 cubic yards; $5.50 per cubic yard.
Puddling, 500 cubic yards; $1.50 per cubic yard.
Dry rolling embankments, 10,000 cubic yards; 1 cent per cubic yard.
Overhaul, 4,000 cubic yards; 1½ cents per cubic yard.
Paving, 500 cubic yards; $5.50 per cubic yard.
Concrete, 1,100 cubic yards; $17 per cubic yard.
Placing steel in reenforced concrete, 80,000 pounds; 5 cents per pound.
Erecting metal work, 15,000 pounds; 6 cents per pound.
Flash boards, 4 by 6 inches by 6 feet 4 inches, 264; $2.75 each.
Flash boards, 4 by 3 inches by 6 feet 4 inches, 16; $2.25 each.
Flash boards, 3 by 6 inches by 4 feet 6 inches, 154; $2.25 each.
Schedule 4, controlling works at Ralston reservoir, $6,770:
Grading, class 1, 50 cubic yards; $1.25 per cubic yard.
Grading, class 2, 20 cubic yards; $2.25 per cubic yard.
Grading, class 3, 20 cubic yards; $5.50 per cubic yard.
Puddling, 200 cubic yards; $1.50 per cubic yard.
Paving, 50 cubic yards; $5.50 per cubic yard.
Concrete, 225 cubic yards; $17.50 per cubic yard.
Placing steel in reenforced concrete, 12,000 pounds; 5 cents per pound.
Erecting metal work, 15,000 pounds; 6 cents per pound.
Sheet piles, furnished, 3,000 feet B. M.; $55 per M feet B. M.
Sheet piles, driving, 600 linear feet; 50 cents per linear foot.
Flash boards, 4 by 6 inches by 4 feet 8 inches, 30; $2.50 each.
Schedule 5, highway bridge abutments, $1,680:
Grading, class 1, 50 cubic yards; $1.25 per cubic yard.
Grading, class 2, 10 cubic yards; $2.25 per cubic yard.
Class 3, 10 cubic yards; $5.50 per cubic yard.
Concrete, 75 cubic yards; $20 per cubic yard.
Placing steel in reenforced concrete, 400 pounds; 10 cents per pound.

On March 18, 1907, before force account work began, W. D. Lovell, of Minneapolis, Minn., submitted an informal proposal for building these structures, which proposal was accepted and a contract made with him April 9, 1907.

Following is informal proposal received from W. D. Lovell on March 18, 1907, for building structures on division 1, Garland canal:

Informal proposal received March 18, 1907, from W. D. Lovell for structures, division 1, Garland canal.

Schedule 1 (headgates), $4,920:
Grading, class 1, 50 cubic yards; $1 per cuubic yard.
Grading, class 2, 50 cubic yards; $3 per cubic yard.
Grading, class 3, 50 cubic yards; $5 per cubic yard.
Puddling, 200 cubic yards; $1 per cubic yard.
Concrete, 200 cubic yards; $15.30 per cubic yard.
Placing steel in reenforced concrete, 14,000 pounds; $0.03½ per pound.
Erecting metal work, 18,000 pounds; $0.04 per pound.
Schedule 2, culvert under Burlington and Missouri River Railroad, $7,500:
Grading, class 1, 4,500 cubic yards; $0.60 per cubic yard.
Grading, class 2, 50 cubic yards; $2 per cubic yard.
Grading, class 3, 20 cubic yards; $4.50 per cubic yard.
Puddling, 100 cubic yards; $1.25 per cubic yard.
Paving, 150 cubic yards, $5 per cubic yard.
Concrete, 200 cubic yards; $15 per cubic yard.
Placing steel in reenforced concrete, 21,000 pounds; $0.035 per pound.
Schedule 3 (Eagle Nest Creek crossing), $30,457:
Grading, class 1, 12,500 cubic yards; $0.50 per cubic yard.
Grading, class 2, 100 cubic yards; $2 per cubic yard.
Grading, class 3, 100 cubic yards; $4 per cubic yard.
Puddling, 500 cubic yards; $0.75 per cubic yard.
Dry rolling embankments, 10,000 cubic yards; $0.01 per cubic yard.
Overhaul, 4,000 cubic yards; $0.015 per cubic yard.
Paving, 500 cubic yards; $5 per cubic yard.
Concrete, 1,100 cubic yards; $15 per cubic yard.
Placing steel in reenforced concrete, 80,000 pounds; $0.03 per pound.
Erecting metal work, 15,000 pounds, at $0.04 per pound.
Flash boards, 4 by 6 inches by 6 feet 4 inches, 264; $2.65 each.
Flash boards, 4 by 3 inches by 6 feet 4 inches, 16; $2.20 each.
Flash boards, 3 by 6 inches by 4 feet 6 inches, 154; $2.20 each.
Schedule 4 (controlling works at Ralston reservoir), $6,312.50:
Grading, class 1, 50 cubic yards; $0.75 per cubic yard.
Grading, class 2, 20 cubic yards; $2 per cubic yard.
Grading, class 3, 20 cubic yards; $4 per cubic yard.
Pudding, 200 cubic yards; $1.35 per cubic yard.
Paving, 50 cubic yards; $5.50 per cubic yard.
Concrete, 225 cubic yards; $16 per cubic yard.
Placing steel in reenforced concrete, 12,000 pounds; $0.035 per pound.
Erecting metal work, 15,000 pounds; $0.04 per pound.
Sheet piles, furnished, 3,000 feet B. M.; $55 per M feet.
Sheet piles, driving 600 linear feet B. M.; $1.25 per linear foot.
Flash boards, 4 by 6 inches by 4 feet 8 inches; 30 at $2.50 each.
Schedule 5 (highway bridge abutments), $1,355:
Grading, class 1, 50 cubic yards; $0.75 per cubic yard.
Grading, class 2, 10 cubic yards; $2 per cubic yard.
Grading, class 3, 10 cubic yards; $4 per cubic yard.
Concrete, 75 cubic yards; $16 per cubic yard.
Placing steel in reenforced concrete, 400 pounds; $0.05 per pound.

GARLAND CANAL AND LATERALS, DIVISIONS 2 TO 19.

Bids for work on Garland canal and laterals, divisions 2 to 19, comprising 185 miles of canals and laterals for the irrigation of 40,000 acres, were opened March 12, 1907. Only portions of the work were covered by the bids received. Some informal proposals for the greater part of the work were received and considered with the formal ones. Contracts as follows were awarded: April 8,

division 16 to Emanuel Thomas, of Byron, Wyo.; April 12, divisions 9 to 15, 17 and 19 to Johnson Brothers, of Lovell, Wyo.; April 13, divisions 2 and 4 to McGuffey & Blood, of Cody, Wyo.; April 27, division 3 to R. M. Lynn, of Lovell, Wyo. The following is an abstract of the bids opened March 12, 1907, for constructing the Garland canal and laterals, divisions 2 to 19:

Bids opened March 12, 1907, for Garland Canal and laterals, divisions 2–19, Shoshone project, Wyoming.

[Specifications No. 128.]

BIDDERS.

A: A. J. McGuffey–J. Blood, Cody, Wyo.; division 2, $39,184; division 3, $32,900; division 4, $25,680; division 5, $27,475.20; division 6, $27,404; division 7, $29,089.60; division 8, $33,367.20; division 9, $19,086; division 10, $7,438.40; division 11, $13,229.20; division 12, $10,368.80; division 13, $3,641.60; division 14, $5,048.40; division 15, $7,545.60; division 16, $11,740.40; division 17, $14,263.20; division 18, $7,720; division 19, $14,469.20; for any two divisions only.

B: Emanuel Thomas, Byron, Wyo.; division 16, $5,629 (informal proposal).

C: G. W. Johnson, Lovell, Wyo.; division 5, $26,700; division 6, $28,210; division 7, $29,310; division 8, $33,310. Informal proposals on the following divisions: division 9, $14,050; division 10, $5,340; division 11, $10,020; division 12, $9,530; division 13, $3,450; division 14, $2,940; division 15, $4,580; division 17, $12,480; division 18, $5,410; division 19, $10,580.

D: R. M. Lynn, Lovell, Wyo.; informal proposals only; division 3, $26,950; division 4, $23,100; for one division only.

DIVISION 2, BIDDER A*

Excavation, class 1, 112,000 cu. yds.: 25 cents per cu. yd.
Excavation, class 2, 3,000 cu. yds.: 60 cents per cu. yd.
Excavation, class 3, 5,000 cu. yds.: $1 per cu. yd.
Overhaul, 74,000 cu. yds.: 2 cents per cu. yd.
Laterals, 5 second-foot, 3.5 miles: $352 per mile.
Laterals, 10 second-foot, 1.9 miles: $880 per mile.

DIVISION 3.

Excavation, class 1, 95,000 cu. yds.:
Bidder A, 30 cents per cu. yd.
Bidder D, 24 cents per cu. yd.
Excavation, class 2, 2,500 cu. yds.:
Bidder A, 60 cents per cu. yd.
Bidder D, 50 cents per cu. yd.
Excavation, class 3, 500 cu. yds.:
Bidder A, $1 per cu. yd.
Bidder D, $1 per cu. yd.
Overhaul, 120,000 cu. yds.:
Bidder A, 2 cents per cu. yd.
Bidder D, 2 cents per cu. yd.

DIVISION 4.

Excavation, class 1, 1,000 cu. yds.:
Bidder A, 28 cents per cu. yd.
Bidder D, 25 cents per cu. yd.
Excavation, class 2, 1,500 cu. yds.:
Bidder A, 60 cents per cu. yd.
Bidder D, 50 cents per cu. yd.
Excavation, class 3, 500 cu. yds.:
Bidder A, $1 per cu. yd.
Bidder D, $1 per cu. yd.
Overhaul, 120,000 cu. yds.:
Bidder A, 2 cents per cu. yd.
Bidder D, 2 cents per cu. yd.

DIVISION 5.

Excavation, class 1, 91,000 cu. yds.:
Bidder A, 20 cents per cu. yd.
Bidder C, 22 cents per cu. yd.
Excavation, class 2, 1,500 cu yds.:
Bidder A, 60 cents per cu. yd.
Bidder C, 50 cents per cu. yd.
Excavation, class 3, 3,000 cu. yds.:
Bidder A, $1 per cu. yd.
Bidder C, $1 per cu. yd.
Overhaul, 40,000 cu. yds.:
Bidder A, 2 cents per cu. yd.
Bidder C, 2 cents per cu. yd.
Laterals, 5 second-foot, 4 miles:
Bidder A, $352 per mile.
Bidder C, $300 per mile.

* Only bidder.

DIVISION 5—Continued.

Laterals, 10 second-foot, 2.2 miles:
Bidder A, $880 per mile.
Bidder C, $300 per mile.
Laterals, 15 second-foot, 0.9 miles:
Bidder A, $1,368 per mile.
Bidder C, $300 per mile.

DIVISION 6.

Excavation, class 1, 91,000 cu. yds.:
Bidder A, 20 cents per cu. yd.
Bidder C, 23 cents per cu. yd.
Excavation, class 2, 1,500 cu. yds.:
Bidder A, 60 cents per cu. yd.
Bidder C, 50 cents per cu. yd.
Excavation, class 3, 3,500 cu. yds.:
Bidder A, $1 per cu. yd.
Bidder C, $1 per cu. yd.
Overhaul, 30,000 cu. yds.:
Bidder A, 2 cents per cu. yd.
Bidder C, 2 cents per cu. yd.
Laterals, 5 second-foot, 6 miles:
Bidder A, $352 per mile.
Bidder C, $300 per mile.
Laterals, 10 second-foot, 1.6 miles:
Bidder A, $880 per mile.
Bidder C, $300 per mile.
Laterals, 15 second-foot, 0.5 miles:
Bidder A, $1,368 per mile.
Bidder C, $300 per mile.

DIVISION 7.

Excavation, class 1, 72,000 cu. yds.:
Bidder A, 20 cents per cu. yd.
Bidder C, 24 cents per cu. yd.
Excavation, class 2, 6,500 cu. yds.:
Bidder A, 60 cents per cu. yd.
Bidder C, 50 cents per cu. yd.
Excavation, class 3, 6,500 cu. yds.:
Bidder A, $1 per cu. yd.
Bidder C, $1 per cu. yd.
Overhaul, 30,000 cu. yds.:
Bidder A, 2 cents per cu. yd.
Bidder C, 2 cents per cu. yd.
Laterals, 5 second-foot, 2.9 miles:
Bidder A, $352 per mile.
Bidder C, $300 per mile.
Laterals, 10 second-foot, 2.1 miles:
Bidder A, $880 per mile.
Bidder C, $300 per mile.
Laterals, 15 second-foot, 0.6 mile:
Bidder A, $1,368 per mile.
Bidder C, $300 per mile.

DIVISION 8.

Excavation, class 1, 65,000 cu. yds.:
Bidder A, 22 cents per cu. yd.
Bidder C, 25 cents per cu. yd.
Excavation, class 2, 15,500 cu. yds.:
Bidder A, 60 cents per cu. yd.
Bidder C, 50 cents per cu. yd.
Excavation, class 2, 300 cu. yds.:
Bidder A, 70 cents per cu. yd.
Bidder C, 50 cents per cu. yd.

DIVISION 8—Continued.

Excavation, class 3, 8,000 cu. yds.:
Bidder A, $1 per cu. yd.
Bidder C, $1 per cu. yd.
Overhaul, 25,000 cu. yds.:
Bidder A, 2 cents per cu. yd.
Bidder C, 2 cents per cu. yd.
Laterals, 5 second-foot, 2.1 miles:
Bidder A, $352 per mile.
Bidder C, $300 per mile.
Laterals, 10 second-foot, 0.6 mile:
Bidder A, $880 per mile.
Bidder C, $300 per mile.

DIVISION 9.

Excavation, class 1, 35,000 cu. yds.:
Bidder A, 22 cents per cu. yd.
Bidder C, 22 cents per cu. yd.
Excavation, class 2, 1,800 cu. yds.:
Bidder A, 70 cents per cu. yd.
Bidder C, 50 cents per cu. yd.
Excavation, class 3, 1,300 cu. yds.:
Bidder A, $1.10 per cu. yd.
Bidder C, $1 per cu. yd.
Overhaul, 20,000 cu. yds.:
Bidder A, 2 cents per cu. yd.
Bidder C, 2 cents per cu. yd.
Laterals, 5 second-foot, 6.6 miles:
Bidder A, $352 per mile.
Bidder C, $300 per mile.
Laterals, 10 second-foot, 4.3 miles:
Bidder A, $880 per mile.
Bidder C, $300 per mile.
Laterals, 15 second-foot, 1.6 miles:
Bidder A, $1,368 per mile.
Bidder C, $300 per mile.

DIVISION 10.

Excavation, class 1, 11,000 cu. yds.:
Bidder A, 22 cents per cu. yd.
Bidder C, 22 cents per cu. yd.
Excavation, class 2, 900 cu. yds.:
Bidder A, 70 cents per cu. yd.
Bidder C, 50 cents per cu. yd.
Excavation, class 3, 300 cu. yds.:
Bidder A, $1.10 per cu. yd.
Bidder C, $1 per cu. yd.
Overhaul, 2,000 cu. yds.:
Bidder A, 2 cents per cu. yd.
Bidder C, 2 cents per cu. yd.
Laterals, 5 second-foot, 4.5 miles:
Bidder A, $352 per mile.
Bidder C, $300 per mile.
Laterals, 10 second-foot, 2.3 miles:
Bidder A, $880 per mile.
Bidder C, $300 per mile.
Laterals, 15 second-foot, 0.3 mile:
Bidder A, $1,368 per mile.
Bidder C, $300 per mile.

DIVISION 11.

Excavation, class 1, 30,000 cu. yds.:
Bidder A, 22 cents per cu. yd.
Bidder C, 22 cents per cu. yd.

DIVISION 11—Continued.

Excavation, class 3, 200 cu. yds.:
Bidder A, $1.10 per cu. yd.
Bidder C, $1 per cu. yd.
Overhaul, 2,000 cu. yds.:
Bidder A, 2 cents per cu. yd.
Bidder C, 2 cents per cu. yd.
Laterals, 5 second-foot, 6 miles:
Bidder A, $352 per mile.
Bidder C, $300 per mile.
Laterals, 10 second-foot, 3.2 miles:
Bidder A, $880 per mile.
Bidder C, $300 per mile.
Laterals, 15 second-foot, 0.9 mile:
Bidder A, $1,368 per mile.
Bidder C, $300 per mile.

DIVISION 12.

Excavation, class 1, 29,000 cu. yds.:
Bidder A, 22 cents per cu. yd.
Bidder C, 22 cents per cu. yd.
Excavtion, class 2, 700 cu. yds.:
Bidder A, 70 cents per cu. yd.
Bidder C, 50 cents per cu. yd.
Excavation, class 3, 500 cu. yds.:
Bidder A, $1.10 per cu. yd.
Bidder C, $1 per cu. yd.
Overhaul, 4,000 cu. yds.:
Bidder A, 2 cents per cu. yd.
Bidder C, 2 cents per cu. yd.
Laterals, 5 second-foot, 6.9 miles:
Bidder A, $352 per mile.
Bidder C, $300 per mile.
Laterals, 10 second-foot, 0.5 mile:
Bidder A, $880 per mile.
Bidder C, $300 per mile.

DIVISION 13.

Excavation, class 1, 11,000 cu, yds.:
Bidder A, 22 cents per cu. yd.
Bidder C, 22 cents per cu. yd.
Excavation, class 2, 500 cu. yds.:
Bidder A, 70 cents per cu. yd.
Bidder C, 50 cents per cu. yd.
Excavation, class 3, 500 cu. yds:
Bidder A, $1.10 per cu. yd.
Bidder C, $1 per cu. yd.
Overhaul, 2,000 cu. yds.:
Bidder A, 2 cents per cu. yd.
Bidder C, 2 cents per cu yd.
Laterals, 5 second-foot, 0.8 mile:
Bidder A, $352 per mile.
Bidder C, $300 per mile.

DIVISION 14.

Excavation, class 1, 5,500 cu. yds.:
Bidder A, 22 cents per cu. yd.
Bidder C, 22 cents per cu. yd.
Excavation, class 2, 100 cu. yds.:
Bidder A, 70 cents per cu. yd.
Bidder C, 50 cents per cu. yd.
Excavation, class 3, 100 cu. yds.:
Bidder A, $1.10 per cu. yd.
Bidder C, $1 per cu. yd.

DIVISION 14—Continued.

Overhaul, 1,000 cu. yds.:
Bidder A, 2 cents per cu. yd.
Bidder C, 2 cents per cu. yd.
Laterals, 5 second-foot, 2.7 miles:
Bidder A, $352 per mile.
Bidder C, $300 per mile.
Laterals, 10 second-foot, 1.5 miles:
Bidder A, $880 per mile.
Bidder C, $300 per mile.
Laterals, 15 second-foot, 1 mile:
Bidder A, $1,368 per mile.
Bidder C, $300 per mile.

DIVISION 15.

Excavation, class 1, 8,000 cu. yds.:
Bidder A, 22 cents per cu. yd.
Bidder C, 22 cents per cu. yd.
Excavation, class 2, 400 cu. yds.:
Bidder A, 70 cents per cu. yd.
Bidder C, 50 cents per cu. yd.
Excavation, class 3, 200 cu. yds.:
Bidder A, $1.10 per cu. yd.
Bidder C, $1 per cu. yd.
Overhaul, 1,000 cu. yds.:
Bidder A, 2 cents per cu. yd.
Bidder C, 2 cents per cu. yd.
Laterals, 5 second-foot, 4.1 miles:
Bidder A, $352 per mile.
Bidder C, $300 per mile.
Laterals, 10 second-foot, 3.1 miles:
Bidder A, $880 per mile.
Bidder C, $300 per mile.
Laterals, 15 second-foot, 0.8 mile:
Bidder A, $1,368 per mile.
Bidder C, $300 per mile.

DIVISION 16.

Excavation, class 1, 17,000 cu. yds.:
Bidder A, 22 cents per cu. yd.
Bidder B, 20 cents per cu. yd.
Excavation, class 2, 700 cu. yds.:
Bidder A, 70 cents per cu. yd.
Bidder B, 50 cents per cu. yd.
Excavation, class 3, 400 cu. yds.:
Bidder A, $1.10 per cu. yd.
Bidder B, $1 per cu. yd.
Overhaul, 2,000 cu. yds.:
Bidder A, 2 cents per cu. yd.
Bidder B, 2 cents per cu. yd.
Laterals, 5 second-foot, 3.7 miles:
Bidder A, $352 per mile.
Bidder B, $150 per mile.
Laterals, 10 second-foot, 3.4 miles:
Bidder A, $880 per mile.
Bidder B, $160 per mile.
Laterals, 15 second-foot, 2 miles:
Bidder A, $1,368 per mile.
Bidder B, $170 per mile.

DIVISION 17.

Excavation, class 1, 47,000 cu. yds.:
Bidder A, 22 cents per cu. yd.
Bidder C, 22 cents per cu. yd.

DIVISION 17—Continued.

Excavation, class 2, 600 cu. yds.:
Bidder A, 70 cents per cu. yd.
Bidder C, 50 cents per cu. yd.
Excavation, class 3, 200 cu. yds.:
Bidder A, $1.10 per cu. yd.
Bidder C, $1 per cu. yd.
Overhaul, 4,000 cu. yds.:
Bidder A, 2 cents per cu. yd.
Bidder C, 2 cents per cu. yd.
Laterals, 5 second-foot, 2.6 miles:
Bidder A, $352 per mile.
Bidder C, $300 per mile.
Laterals, 10 second-foot, 2.6 miles.
Bidder A, $880 per mile.
Bidder C, $300 per mile.

DIVISION 18.

Excavation, class 1, 10,000 cu. yds.:
Bidder A, 22 cents per cu. yd.
Bidder C, 22 cents per cu. yd.
Excavation, class 2, 600 cu. yds.:
Bidder A, 70 cents per cu. yd.
Bidder C, 50 cents per cu. yd.
Excavation, class 3, 400 cu. yds.:
Bidder A, $1.10 per cu. yd.
Bidder C, $1 per cu. yd.
Overhaul, 1,000 cu. yds.:
Bidder A, 2 cents per cu. yd.
Bidder C, 2 cents per cu. yd.

DIVISION 18—Continued.

Laterals, 5 second-foot, 5.6 miles:
Bidder A, $352 per mile.
Bidder C, $300 per mile.
Laterals, 10 second-foot, 2.1 miles:
Bidder A, $880 per mile.
Bidder C, $300 per mile.
Laterals, 15 second foot, 0.6 mile:
Bidder A, $1,368 per mile.
Bidder C, $300 per mile.

DIVISION 19.

Excavation, class 1, 25,000 cu. yds.:
Bidder A, 22 cents per cu. yd.
Bidder C, 22 cents per cu. yd.
Excavation, class 2, 700 cu. yds.:
Bidder A, 70 cents per cu. yd.
Bidder C, 50 cents per cu. yd.
Excavation, class 3, 1,000 cu. yds.:
Bidder A, $1.10 per cu. yd.
Bidder C, $1 per cu. yd.
Overhaul, 2,000 cu. yds.:
Bidder A, 2 cents per cu. yd.
Bidder C, 2 cents per cu. yd.
Laterals, 5 second-foot, 6.6 miles:
Bidder A, $352 per mile.
Bidder C, $300 per mile.
Laterals, 10 second-foot, 5.7 miles:
Bidder A, $880 per mile.
Bidder C, $300 per mile.

STRUCTURES ON GARLAND CANAL AND LATERALS, DIVISIONS 2 TO 19.

Bids for structures on these divisions were to be opened March 17, 1907. No bids were received, and on May 2 the work was authorized to be done by force account.

CEMENT.

Bids for cement were opened March 12, 1907. Only one bid was received—that of the Universal Portland Cement Company of Chicago, Ill.—the price being $1.50 per barrel, f. o. b. South Chicago. This bid was accepted and contract made April 3, 1907. Deliveries of cement under this contract began shortly after its date.

STEEL.

Bids for furnishing 405,000 pounds of steel for reenforcement of concrete were formally advertised for to be opened July 24, 1906, at Billings, Mont. Nine bids were received. On August 14 the contract was awarded the Expanded Metal and Corrugated Bar Company of St. Louis, Mo.

Bids for furnishing an additional 900,000 pounds of steel for reenforcement of concrete were opened April 24, 1907, at Huntley, Mont. Three bids were received. On May 8, 1907, the contract was awarded the Expanded Metal and Corrugated Bar Company, of *St. Louis, Mo.*

Following are abstracts of bids received:

Bids opened July 24, 1906, for steel, Shoshone project, Wyoming.

BIDDERS.

A. Jones & Laughlin Steel Company, Chicago, Ill., f. o. b. Pittsburg; $5,643 (plain square steel bars
B. J. Edward Ogden Company New York, N. Y., f. o. b. Pittsburg; $6,008.80 (plain square steel bars).
C. James Blake Kendall, Washington, D. C., f. o. b. Pittsburg; $6,250.50 plain square steel bars).
D. Carnegie Steel Company, Pittsburg, f. o. b. Pittsburg $6,250.50 (plain square steel bars).
E. Expanded Metal and Corrugated Bar Company, St. Louis, Mo., f. o. b. Youngstown, Ohio; $7,060.50 (Johnson square corrugated bars).
F. J. Edward Ogden Co., New York, N. Y., f. o. b. Tonawanda, N. Y.; $7,516.50 twisted steel bars)
G. Crucible Steel Company of America, Pittsburg, Pa., f. o. b. Pittsburg; $8,275.50 (plain square steel bars).
H. N. J. Foundry and Machine Company, New York, N. Y., f. o. b. Chicago; $8,907.05 (twisted steel bars).
I. Expanded Metal and Corrugated Bar Company, St. Louis, Mo., f. o. b. Minnequa, Colo.; $9,085.50 (Johnson square corrugated bars).

ITEM 1.

Three-eighths-inch bars, 5,000 pounds:
Bidder A, $0.0160 per pound.
Bidder B, $0.0169 per pound.
Bidder C, $0.0245 per pound.
Bidder D, $0.0175 per pound.
Bidder E, $0.0195 per pound.
Bidder F, $0.0220 per pound.
Bidder G, $0.0225 per pound.
Bidder H, $0.0256 per pound.
Bidder I, $0.0245 per pound.

ITEM 2.

One-half-inch bars, 87,000 pounds:
Bidder A, $0.0145 per pound.
Bidder B, $0.0154 per pound.
Bidder C, $0.0160 per pound.
Bidder D, $0.0160 per pound.
Bidder E, $0.0180 per pound.
Bidder F, $0.0195 per pound.
Bidder G, $0.0210 per pound.
Bidder H, $0.0227 per pound.
Bidder I, $0.0230 per pound.

ITEM 3.

Five-eighths-inch bars, 13,000 pounds:
Bidder A, $0.0140 per pound.
Bidder B, $0.0150 per pound.
Bidder C, $0.0155 per pound.
Bidder D, $0.0155 per pound.

ITEM 3—Continued.

Five-eighths-inch bars,13,000 pounds—Continued.
Bidder E. $0.0175 per pound.
Bidder F, $0.0185 per pound.
Bidder G, $0.0205 per pound.
Bidder H, $0.02215 per pound.
Bidder I, $0.0225 per pound.

ITEM 4.

Eleven-sixteenths-inch bars, 139,000 pounds:
Bidder A, $0.0140 per pound.
Bidder B, $0.0149 per pound.
Bidder C, $0.0155 per pound.
Bidder D, $0.0155 per pound.
Bidder E, $0.0175 per pound (for ⅞-inch bars).
Bidder F, $0.0185 per pound.
Bidder G, $0.0205 per pound.
Bidder H, $0.02215 per pound.
Bidder I, $0.0225 per pound (for ⅞-inch bars).

ITEM 5.

Three-fourths-inch bars, 121,000 pounds:
Bidder A, $0.0135 per pound.
Bidder B, $0.0144 per pound.
Bidder C, $0.0150 per pound.
Bidder D, $0.0150 per pound.
Bidder E, $0.0170 per pound.
Bidder F, $0.0180 per pound.
Bidder G, $0.0200 per pound.
Bidder H, $0.02135 per pound.
Bidder I, $0.0220 per pound.

ITEM 6.

Thirteen-sixteenths-inch bars, 12,000 pounds:
Bidder A, $0.0135 per pound.
Bidder B, $0.0144 per pound.
Bidder C, $0.0150 per pound.
Bidder D, $0.0150 per pound.
Bidder E, $0.0170 per pound (for ¾-inch bars).
Bidder F, $0.0180 per pound.
Bidder G, $0.0200 per pound.
Bidder H, $0.02135 per pound.
Bidder I, $0.0220 per pound (for ¾-inch bars).

ITEM 7.

Seven-eighths-inch bars, 28,000 pounds:
Bidder A, $0.0135 per pound.
Bidder B, $0.0144 per pound.
Bidder C, $0.0150 per pound.
Bidder D, $0.0150 per pound.
Bidder E, $0.0170 per pound.
Bidder F, $0.0180 per pound.
Bidder G, $0.0200 per pound.
Bidder H, $0.02135 per pound.
Bidder I, $0.0220 per pound.

Bids opened April 24, 1907, for reenforcing steel, Shoshone project, Wyoming.

[Specifications No. 142.]

BIDDERS.

A: Expanded Metal and Corrugated Bar Company, St. Louis, Mo., f. o. b. Youngstown, Ohio, Johnson's corrugated section; $19,235.47. Delivery 60 to 90 days. (In case lengths are less than 5 feet add 5 cents per hundred pounds. In case lengths are less than 2 feet add 10 cents per hundred pounds.)

B: The General Fireproofing Company, Youngstown, Ohio, f. o. b. Youngstown, Ohio, cold twisted lug bar; $20,025.83. Delivery, 50 per cent 30 days and 50 per cent 60 days.

C: Trussed Concrete Steel Company, Detroit, Mich., f. o. b. Pittsburg, Pa., "cup-bar;" $23,269.84. Delivery 30 days after award of contract.

ITEM 1.

One-fourth-inch bars:
Bidder A, 32,880 pounds, at $0.0227 per pound.
Bidder B, 30,414 pounds, at $0.026 per pound.
Bidder C, 34,525 pounds, at $0.0235 per pound.

ITEM 2.

Three-eighths-inch bars:
Bidder A, 350,374 pounds, at $0.0217 per pound.
Bidder B, 360,636 pounds, at $0.024 per pound.
Bidder C, 420,000 pounds, at $0.022 per pound.

ITEM 3.

One-half-inch bars:
Bidder A, 413,100 pounds, at $0.0202 per pound.

ITEM 3—Continued.

One-half-inch bars—Continued.
Bidder B, 422,820 pounds, at $0.019 per pound.
Bidder C, 486,000 pounds, at $0.021 per pound.

ITEM 4.

Three-fourths-inch bars:
Bidder A, 95,500 pounds, at $0.0192 per pound.
Bidder B, 97,000 pounds, at $0.019 per pound.
Bidder C, 114,000 pounds, at $0.020 per pound.

ITEM 5.

One-inch bars:
Bidder A, 28,220 pounds, at $0.0192 per pound.
Bidder B, 28,635 pounds, at $0.019 per pound.
Bidder C, 31,042 pounds, at $0.019 per pound.

ITEM 6.

One and one-half-inch bars (1½ inches specified by Bidders A and B):
Bidder A, 2,283 pounds, at $0.0192 per pound.
Bidder B, 3,311 pounds, at $0.019 per pound.
Bidder C, 3,440 pounds, at $0.0175 per pound.

ITEM 7.

One-half-inch plain round bars:
Bidder A, 5,500 pounds, at $0.0222 per pound.
Bidder B, 5,500 pounds, at $0.0175 per pound.
Bidder C, 5,500 pounds, at $0.015 per pound.

LUMBER.

Lumber used on the project during the year was partly purchased in open market and partly obtained under the free-use permit from Yellowstone and Pryor Mountain national forests. For that obtained from the national forests contracts were made with local sawmills for cutting, sawing, and delivery at railroad stations.

FARM UNITS.

Farm unit plats have been completed for 40,000 acres of land on Garland Flat.

IRRIGABLE LANDS.

The approximate distribution of the irrigable lands is shown by the following table:

Lands included in Shoshone project.

	Acres.	Percentages.		Acres.	Percentages.
GENERAL.			IRRIGABLE.		
Total	151,680	.....	Total (all in Bighorn County)	132,000	.....
Private	1,420	01—	North of Shoshone River	107,000	81+
Public	150,260	99+	South of Shoshone River	25,000	19—
Irrigable	132,000	87+	Bottom land, Shoshone River	None.	.....
Nonirrigable	19,680	13—	Under existing canals[a]	1,900	00+
PRIVATE.			Above existing canals	130,100	100—
Total	1,420	.....	Public	130,780	99+
Irrigable	1,220	86—	Private	1,220	01—
Nonirrigable	200	14+	NONIRRIGABLE.		
PUBLIC.			Total	19,680	.....
Total	150,260	.....	Public	19,480	99—
Irrigable	130,780	87+	Private	200	01+
Nonirrigable	19,480	13—			

[a] Under Elk Canal title to lands still in the United States.

EXPENDITURES.

The expenditures on this project to June 30, 1907, are summarized in the following table:

Expenditures, according to physical features, on Shoshone project to June 30, 1907.

Features.	Engineering and administration.	Building.
Incidental structures:		
Shoshone Canyon road, 4 miles	$3,800.00	$44,163.07
Telephone line, 38 miles	315.00	3,672.70
Shoshone dam, temporary work	2,960.00	30,800.00
Headquarters:		
Offices	831.00	3,710.00
Lodging and mess houses	3,925.00	15,034.72
Warehouses, corrals, etc	60.00	3,000.00
Irrigation structures:		
Shoshone reservoir, lands submerged	3,700.00	91,561.72
Shoshone dam and spillway	29,043.00	62,066.00
Shoshone outlet works and gates	2,880.00	22,293.15
High line canal	18,520.00	.....
Corbett dam	3,903.80	81,623.28
Corbett tunnel	30,601.26	582,881.94
Settling basin embankment	632.20	22,889.40
Garland-Frannie canal and laterals	39,810.52	215,537.63
Structures, Garland-Frannie canal and laterals	2,500.00	10,700.00
Willwood diversion weir	225.00	.....
Willwood tunnel	811.00	.....
Willwood canal and distribution	8,213.00	.....
Irrigable lands:		
Farm unit subdivision and soil examination	4,673.85	.....
Examination of the project as a whole	67,863.54	.....
Administration of project as a whole	24,012.60	.....
Total	249,280.77	1,189,933.61
Grand total	1,439,214.38	

Total expenditures, according to purpose and nature, on Shoshone project to June 30, 1907.

[Total, $1,439,214.38.]

	Services.	Traveling.	Subsistence.	Equipment.	Materials.	Supplies.	Rent and storage.	Forage.	Job work.
Engineering:									
Examination	$1,113.59	$299.38	$20.25	$718.40	.....	$628.03	$10.80	$13.38	$6.46
Survey	53,687.99	5,559.63	8,796.55	9,976.51	$112.63	9,024.13	53.99	4,140.51	.....
Design	15,458.43	1,185.17	906.70	134.10	5.60	1,029.17	223.00	87.99	430.47
Subdivision	3,451.08	289.11	539.36	365.09	23.33	334.24	17.59	253.51	.....
Building:									
Rights and property	565.01	465.80	31.50	5.55	.....	49,290.06	1.00	.....	35.00
Building	485,321.87	4,618.15	81,583.60	30,440.49	129,670.74	141,778.83	356.90	11,234.52	336,314.91
Administration	36,121.93	3,145.69	993.53	2,169.56	2.00	4,317.47	1,526.85	327.25	.....

PROPOSED LAKE DE SMET PROJECT.

The preliminary surveys and examinations of this proposed project are reported in the Second and Fifth Annual Reports of the Reclamation Service.

From an examination made in May, 1906, by a board of engineers, it was developed that practically all of the irrigable land tributary to Lake De Smet is in private ownership, and that the water of Piney Creek has been appropriated by a large number of small landowners.

It was thought desirable, therefore, to give the present owners of the land an opportunity to increase their present water supply, and the area withdrawn for investigation by the Reclamation Service was restored to entry by the Secretary's order, dated June 9, 1906.

The net expenditures to June 30, 1907, are $9,016.28.

APPENDIX.

As this report goes to press it is possible to add the following additional data regarding receipts and allotments:

RECEIPTS.

The actual net proceeds from sales of public lands during the fiscal year 1907 were $7,914,131.71, which amount was made available by an appropriation warrant dated December 31, 1907. The following table shows the actual annual accretion by States for the fiscal years 1901 to 1907, the total amount arising from each State, the restricted fund (51 per cent) for each State, and the order of the States as to amounts of such funds indicated by figures:

Actual annual accretions by States from sales of public lands during the fiscal years 1901 to 1907, inclusive.

State.	1901.	1902.	1903.	1904.	1905.
Arizona	$42,586.16	$39,187.35	$48,360.20	$63,266.02	$50,368.46
California	205,030.40	298,240.36	839,221.40	482,077.16	498,488.37
Colorado	254,889.88	374,105.13	549,812.89	472,379.85	318,546.14
Idaho	206,645.36	300,803.27	650,331.95	493,697.20	383,221.74
Kansas	20,188.78	28,946.94	27,836.50	32,478.56	30,423.91
Montana	367,342.31	405,035.49	558,071.49	466,708.41	349,529.75
Nebraska	102,963.24	132,234.94	138,728.70	118,786.59	179,136.10
Nevada	9,183.47	14,230.61	14,136.76	16,210.58	11,167.70
New Mexico	75,203.06	72,054.60	154,265.49	86,602.58	133,243.57
North Dakota	449,474.96	778,021.35	1,244,916.47	1,160,386.68	807,792.48
Oklahoma	370,464.93	638,330.44	834,766.83	763,511.39	490,629.78
Oregon	364,988.62	545,972.44	1,896,970.68	1,350,651.21	610,797.39
South Dakota	113,274.20	194,288.17	248,696.14	249,225.28	217,688.34
Utah	98,416.00	48,408.38	88,872.38	48,716.82	77,662.81
Washington	257,180.95	536,907.82	1,109,299.54	696,271.34	451,773.36
Wyoming	206,989.50	178,773.24	279,709.18	325,283.92	195,045.49
Total	3,144,821.91	4,585,520.53	8,713,996.60	6,826,253.59	4,805,515.39

State.	1906.	1907.	Totals, 1901–1907.	Restricted funds, 51 per cent.	Order of States as to amount.
Arizona	$54,559.06	$71,688.72	$370,015.97	$188,708.14	14
California	239,320.01	365,995.19	2,928,372.89	1,493,470.17	8
Colorado	534,068.16	613,520.03	3,117,322.08	1,589,834.26	6
Idaho	315,175.56	712,550.09	3,062,425.17	1,561,836.84	7
Kansas	75,370.50	88,937.79	304,182.98	155,133.32	15
Montana	486,637.10	749,482.68	3,382,807.23	1,725,231.69	5
Nebraska	74,704.24	73,533.61	820,087.42	418,244.58	12
Nevada	35,843.13	45,154.36	145,926.61	74,422.57	16
New Mexico	202,015.97	382,856.77	1,106,222.04	564,173.24	11
North Dakota	933,012.96	1,101,638.16	6,475,243.06	3,302,373.96	2
Oklahoma	514,325.73	530,664.25	4,172,693.35	2,128,073.61	4
Oregon	491,069.48	1,519,958.62	6,780,408.44	3,458,008.30	1
South Dakota	279,300.55	505,779.42	1,808,252.10	922,208.57	10
Texas					17
Utah	114,595.02	141,156.18	617,827.59	315,092.07	13
Washington	489,958.56	703,902.62	4,245,294.19	2,165,100.04	3
Wyoming	326,380.47	378,103.57	1,890,285.46	964,045.58	9
Total	5,166,336.50	7,984,922.06	41,227,366.58	21,025,956.94	
Unrestricted fund				20,201,409.64	
				41,227,366.58	

ALLOTMENTS.

On December 13, 1907, the Secretary of the Interior approved a revision of the former tentative allotments for the calendar year 1908, based upon the actual proceeds of sales of public lands during the fiscal year 1907.

The following table shows the present allotments up to December 31, 1908:

Project allotments as revised December 13, 1907, for calendar years 1902 to 1906, 1907, and 1908.

Project.	Allotment, 1902 to 1906.	Allotment, 1907.	Allotment, 1908.	Total allotment, 1902 to 1908.
Salt River	$3,059,412.22	$1,390,000.00	$850,587.78	$5,300,000.00
Orland	8,776.19	6,000.00	150,223.81	165,000.00
Yuma	805,981.00	948,000.00	821,019.00	2,575,000.00
Uncompahgre	1,907,790.37	972,000.00	460,209.63	3,340,000.00
Grand Valley	8,712.20	1,287.80	40,000.00	50,000.00
Minidoka	1,397,115.60	432,000.00	[a] 70,884.40	[a] 1,900,000.00
Payette-Boise	565,825.76	894,000.00	[a] 440,174.24	[a] 1,900,000.00
Garden City	33,797.86	226,000.00	75,202.14	335,000.00
St. Mary	139,510.64	139,000.00	[b] 96,489.36	[b] 375,000.00
Huntley	351,381.07	433,000.00	65,618.93	850,000.00
Sun River	79,706.68	279,000.00	101,293.32	460,000.00
North Platte	1,543,726.20	1,808,000.00	[a] 448,273.80	[a] 3,800,000.00
Truckee-Carson	3,345,855.32	476,000.00	140,144.68	3,962,000.00
Hondo	348,708.18	9,000.00	12,291.82	370,000.00
Carlsbad	372,843.77	199,000.00	28,156.23	600,000.00
Leasburg	11,603.74	185,000.00	13,396.26	210,000.00
Rio Grande	48,404.15	1,000.00	5,595.85	55,000.00
Williston	65,505.74	309,000.00	20,494.26	395,000.00
Buford-Trenton	14,018.24	288,000.00	20,981.76	323,000.00
Nesson	22,796.48	5,000.00	5,203.52	33,000.00
Lower Yellowstone	550,478.90	1,347,000.00	452,521.10	2,350,000.00
Cimarron	508.26	6,000.00	5,491.74	12,000.00
Umatilla	128,117.13	578,000.00	303,882.87	1,010,000.00
Klamath	710,384.11	670,000.00	354,615.89	1,735,000.00
Belle Fourche	561,925.21	810,000.00	628,074.79	2,000,000.00
Strawberry Valley	119,139.89	300,000.00	190,860.11	610,000.00
Okanogan	90,420.80	282,000.00	72,579.20	445,000.00
Tieton	70,000.00	534,000.00	806,000.00	1,410,000.00
Sunnyside	301,000.00	207,000.00	287,000.00	795,000.00
Wapato	15,747.33	4,000.00	40,252.67	60,000.00
Shoshone	715,954.34	1,418,000.00	541,045.66	2,675,000.00
Reserve for cooperation			[a] 300,000.00	[a] 300,000.00
Secondary projects	674,230.79	24,712.20	21,057.01	720,000.00
Town sites	5,270.08	7,000.00	10,729.92	23,000.00
General administration office	27,089.22	23,407.40	[c] 19,738.25	[c] 70,234.87
Total	18,101,827.47	15,211,407.40	[c] 7,900,000.00	[c] 41,213,234.87
Grand total		33,313,234.87	[c] 41,213,234.87	

[a] Reserve for cooperation of $300,000 available in amounts of $100,000 each on Minidoka, Payette-Boise, and North Platte, contingent upon satisfactory completion of proposed plans for cooperative contributions by settlers.

[b] $100,000 of allotment for St. Mary contingent upon conclusion of agreement with Canada.

[c] Allotment for purchases, etc., through general administrative office and totals for 1908 and total to December 31, 1908, subject to revision when receipts for 1907 are accurately determined.

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